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AERODYNAMIC LOADING CHARACTERISTICS OF
A REENTRY-GLIDER AND LAUNCH-VEHICLE
MODEL AT TRANSONIC SPEEDS

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AERODYNAMIC LOADING CHARACTERISTICS OF A REENTRY-GLIDER
AND LAUNCH-VEHICLE MODEL AT TRANSONIC SPEEDS*

By James A. Blackwell, Jr., and Thomas C. Kelly
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SUMMARY

A wind-tunnel investigation was conducted over a Mach number range from 0.6 to 1.2 to determine the static aerodynamic loading characteristics of a typical winged reentry glider in combination with a simulated launch vehicle. The Reynolds number of the tests varied with Mach number over a range from 3.17×10^6 per foot to 4.22×10^6 per foot.

The results of the investigation indicate that interference effects associated with the asymmetrical geometry of the winged reentry glider cause changes in the type of flow (separated or attached) circumferentially about the launch-vehicle upper stage. These variations in the type of flow over the launch vehicle and, hence, in the launch-vehicle surface-pressure coefficients, generally extend approximately 2.5 upper-stage diameters behind the rear corner of the conical fairing.

As a probable result of the flow separation, section normal-force coefficients on the launch-vehicle upper stage immediately behind the winged reentry glider do not vary appreciably with angle of attack.

Comparison of the section normal-force coefficient distributions for the launch vehicle in the present winged reentry glider configuration with that for a similar launch vehicle having a conical nose with a 15.3° half-angle shows the resultant normal force on the forward portion of the launch-vehicle upper stage resulting from the loads carryover of the winged reentry glider to be noticeably lower than that associated with the conical nose.

INTRODUCTION

Vehicles with glide-reentry requirements are presently being developed to provide basic data for designing advanced spacecraft and to further the development of manned reentry. A typical vehicle for these purposes is the USAF ASSET (aerothermodynamic structural systems environmental tests) test vehicle. As part of a general program to determine the static aerodynamic loading characteristics of simulated launch vehicles and in support of the ASSET development

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program, tests have been conducted at transonic speeds to determine the static aerodynamic loading characteristics of a typical winged reentry glider (ASSET) in combination with a simulated launch vehicle.

The investigation was conducted in the Langley 8-foot transonic pressure tunnel over a Mach number range from 0.6 to 1.2. The Reynolds number of the tests varied with Mach number over a range from 3.17×10^6 per foot to 4.22×10^6 per foot. The angle of attack varied generally from about -6° to 6° .

SYMBOLS AND COEFFICIENTS

D	launch-vehicle local diameter, in.
r	launch-vehicle local radius, in.
x	model station, measured from a point located 50 inches forward of launch-vehicle base, in.
y	lateral distance, measured from launch-vehicle center line, in.
M	Mach number
R	Reynolds number per foot
α	nominal angle of attack of launch-vehicle center line (does not include corrections for deflection of model and support system due to load), deg
ϕ	launch-vehicle orifice-row orientation angle, measured clockwise from the vertical as viewed from front, deg
p	local static pressure, lb/sq ft
p_∞	free-stream static pressure, lb/sq ft
q_∞	free-stream dynamic pressure, lb/sq ft
C_p	pressure coefficient, $\frac{p - p_\infty}{q_\infty}$
c_n	body-section normal-force coefficient, $\int_0^1 (C_{p,l} - C_{p,u}) d\left(\frac{y}{r}\right)$

Subscripts:

l	lower
u	upper
ref	reference

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APPARATUS, TESTS, AND PROCEDURE

Model

Geometric details of the winged reentry glider and launch vehicle are presented in figure 1, and model photographs are provided in figure 2. The arrangement of the pressure orifices on the winged reentry glider shown in figure 1(c) was such that the most comprehensive indication of the local aerodynamic loads on the winged reentry glider could be obtained by using the maximum number of available pressure-measurement channels. Pressure orifices on the launch vehicle were installed along four longitudinal rows which were located at meridian angles ϕ of 0° , 30° , 60° , and 90° . The longitudinal orifice locations for the launch vehicle are referenced to model station 0 (fig. 1(a)) and are indicated in tables I and II.

Tests and Procedure

This investigation was conducted in the Langley 8-foot transonic pressure tunnel at a stagnation pressure of approximately 2120 pounds per square foot and at a stagnation temperature of approximately 120° F. Results were obtained over an angle-of-attack range from -6° to 6° at Mach numbers of 0.8, 1.0, and 1.2, and from -10° to 10° at a Mach number of 0.6. In addition, results were obtained at an angle of attack of 0° for Mach numbers of 0.75, 0.85, 0.90, and 0.95. The variation of the average test Reynolds number per foot and dynamic pressure with Mach number is shown in figure 3.

Although only four orifice rows (all in a 90° quadrant) were employed on the launch vehicle for these tests, an attempt was made to simulate the complete surface-pressure distribution about the launch vehicle by testing the complete model with the winged reentry glider in both upright and inverted positions. (See fig. 1(a).) The angle of attack of the model was measured relative to the launch vehicle irrespective of the position of the winged reentry glider.

The investigation was conducted with natural boundary-layer transition on the winged reentry glider and with a boundary-layer transition strip on the launch vehicle located 0.25 inch rearward of the conical-fairing-upper-stage corner. The transition strip was 0.1 inch wide and was composed of No. 80 (0.0083 inch in diameter) carborundum grains set in a plastic adhesive.

Model surface pressures were measured by using multiple-tube manometer boards and were recorded on photographic film.

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CORRECTIONS AND ACCURACY

Corrections

Angles of attack presented herein should be considered as nominal angles in that, although corrections have been made for tunnel air-flow angularity none have been applied for deflection of the model and support system under load. An approximation of the model deflection under load has been made, however, from results obtained from static loadings of the test model and support system. Results of the static loadings are shown in figure 4 for loads applied at three model stations. Based upon normal-force and center-of-pressure results for a similar configuration (ref. 1) and results of the static loadings from figure 4, an additional deflection (in the direction of the resultant normal force) of less than 0.25° would be expected for the maximum-loading condition of the present investigation.

Effects of subsonic boundary interference in the slotted test section are considered to be negligible and no corrections for these effects have been applied. At supersonic speeds, the experimental results are generally affected by boundary-reflected disturbances which occur from Mach numbers slightly over 1.0 to those at which the disturbances are reflected downstream of the model base. For the present investigation, it is estimated that results rearward of the 48-inch model station at a Mach number of 1.2 and an angle of attack of $\pm 6^\circ$ may be subject to error resulting from boundary reflections.

Accuracy

A consideration of factors affecting the results of this investigation has indicated general accuracies in pressure coefficient to be of the order of ± 0.01 and ± 0.005 at Mach numbers of 0.60 and 1.20, respectively. However, in regions of extremely varying pressures or for conditions where the pressures are noticeably sensitive to small Mach number changes, such accuracies may not be expected. Model nominal angles of attack are estimated to be accurate within $\pm 0.1^\circ$. Based upon unpublished tunnel calibrations, local deviations from the quoted free-stream Mach numbers did not exceed ± 0.003 at subsonic speeds and did not become greater than ± 0.010 as the Mach number was increased to 1.20.

RESULTS

Results obtained in the present investigation are presented in the form of surface-pressure coefficients and body section normal-force coefficients.

Pressure coefficients are presented in tables I and II for the winged reentry glider and the launch vehicle, respectively. Representative plots are presented in figures 5, 6, 7, and 8 to show the effects of the winged reentry glider on the surface-pressure coefficients of the launch vehicle at various

Mach numbers and angles of attack. In figure 9, schlieren photographs of the flow over the winged reentry glider, conical fairing, and forward portion of the launch-vehicle upper stage are presented. Also, a comparison of the surface-pressure coefficients at the base of the wing and at the base of the skewed cylinder on the winged reentry glider is shown in figure 10.

For the present investigation it was possible, through the proper combination of data from various test conditions to simulate the complete pressure distribution about the launch vehicle at angles of attack of $\pm 3^\circ$ and $\pm 6^\circ$. These results were then machine integrated in order to obtain the launch-vehicle section normal-force coefficients, which are presented in table III and in figure 11 (multiplied by a diameter ratio). Figure 12 compares the section normal-force coefficient distribution for a launch vehicle with a winged reentry glider with that of a similar launch vehicle having a conical nose (15.3° half-angle). (See configuration 4 of ref. 2.)

Since the orifice arrangement was such that the winged reentry-glider surface-pressure coefficients could not be readily presented graphically and since the winged reentry-glider section normal-force coefficients could not be obtained accurately, the discussion is limited to the effect of the winged reentry glider on the aerodynamic loading characteristics of the launch vehicle. However, the results presented in table I are arranged to permit a relatively easy determination of the effects of Mach number and angle of attack on the surface-pressure coefficients of the winged reentry glider.

DISCUSSION

Surface-Pressure Distributions

The variation of the launch-vehicle surface-pressure coefficients with longitudinal model station is presented in figures 5 and 6 for $\alpha = 0^\circ$. Comparison of the surface-pressure coefficients at the various launch-vehicle orifice row-orientation angles (fig. 5) indicates expected large differences over the conical fairing and launch-vehicle upper stage. These differences in surface-pressure coefficients result from the changes in the type of flow (separated or attached) circumferentially about the launch-vehicle upper stage. The surface-pressure coefficients on the launch vehicle for $\phi = 0^\circ$ with winged reentry glider upright (fig. 6(a)) and the schlieren photographs shown in figure 9 indicate that the flow over the winged reentry glider separates at the top rear corner of the skewed cylinder and immerses the forward portion of the launch-vehicle upper surface in the separated flow. It is also of interest to note that, as a result of the separated flow, surface-pressure coefficients at the 11.51 and 12.01 model stations for $\phi = 0^\circ$ (fig. 6(a)) and the pressure coefficient at the base of the skewed cylinder (orifice 21, fig. 10) are of the same relative value. The flow from the bottom of the winged reentry glider over the lower surface of the launch vehicle appears to be attached. (See figs. 6(b) and 9.) The surface-pressure coefficients for the 90° meridian row vary as a result of the separation of flow over the winged reentry-glider side-body planes as shown in figure 6(c). An examination of the surface-pressure

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coefficients shows that the flow-attachment line apparently passes through some point between the 11.51 and 12.01 model stations for Mach numbers up to 1.0, as evidenced by the rapid positive increase in the surface-pressure coefficient over the conical fairing between these model stations. At Mach number 1.2 the flow apparently attaches at some point upstream of the 11.51 model station. The changes in the type of flow (separated or attached) circumferentially about the launch-vehicle upper stage are a result of the asymmetrical geometry of the winged reentry glider. The effects of the asymmetry of the winged reentry glider on the surface-pressure coefficients of the launch vehicle can be seen to extend approximately 2.5-launch-vehicle upper-stage diameters (5.4 in.) behind the rear corner of the conical fairing throughout the test Mach number range; however, for some Mach numbers, the effects are evident as far rearward as the transition flare. (See fig. 5.)

The effects of increasing Mach number on the launch-vehicle surface-pressure coefficients at various orifice-row-orientation angles can be seen in figure 6. Comparison of the results for the various Mach numbers indicates the effects of increasing Mach number to be rapid increases and decreases in the negative surface-pressure coefficient peaks associated with the conical fairing and rear corners of the transition flare, and the general broadening of these peaks. Evident also is the change in the general type of flow over the transition flare for Mach numbers from 0.60 to 1.20. At a Mach number of 0.60, the effects of the compression and expansion corners on the surface-pressure coefficients are felt somewhat upstream; whereas, at a Mach number of 1.20 the changes in the surface-pressure coefficients associated with the compression and expansion waves occur abruptly at the corners.

The effects of angle of attack on the surface-pressure coefficients of the launch vehicle are shown in figure 7 for a representative orifice-row-orientation angle of 0° . These results indicate that the most notable variations with angle of attack occur over the transition flare. The variations in surface-pressure coefficients due to angle of attack are generally larger for orifices on the windward side of the model than for orifices on the leeward side.

A comparison of the surface-pressure coefficients on the launch vehicle in the present winged reentry-glider configuration with those for a launch vehicle having a conical nose (15.3° half-angle; configuration 4 of ref. 2) is shown in figure 8 for $\phi = 0^\circ$, and is indicative of results for the other orifice-row meridian angles. Examination of the results presented in figure 8 indicates differences in the surface-pressure coefficients over most of the launch-vehicle upper stage with the flow properties downstream of the launch-vehicle upper-stage transition-flare juncture being generally the same for both configurations.

Figure 10 indicates the changes in the surface-pressure coefficients which occur at the base of the winged reentry glider at $\alpha = 0^\circ$. Shown are the variations in the base-pressure coefficient with Mach number for two orifice locations, one located on the base of the wing (orifice 11) and the other at the base of the skewed cylinder (orifice 21). Although it would be expected that more negative base-pressure coefficients would exist for the wing base, which is essentially two dimensional, than for the base of the skewed cylinder, which

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is three dimensional, greater differences in the pressure coefficient would be expected than those which are shown in figure 10. (For example, see ref. 3.) Undoubtedly, local configuration geometry greatly influences the base pressures, at least in the present investigation.

Section Normal-Force Distributions

Variations of launch-vehicle section normal-force coefficients (multiplied by a diameter ratio) with longitudinal model station are presented in figure 11 for several Mach numbers and angles of attack. The results indicate that the forward portion of the launch-vehicle upper stage and the transition flare carry most of the aerodynamic load. Of interest also is the fact that the extent of the load carryover on the cylindrical portions of the model just rearward of the conical-fairing and launch-vehicle transition flare, generally increases with an increase in Mach number. As would be expected the variation of the launch-vehicle section normal-force coefficients with angle of attack generally shows a positive increase in the launch-vehicle section normal-force coefficients associated with an increase in the angle of attack and a negative increase associated with a decrease in angle of attack, with the greatest increase noted for the region of the transition flare. However, a comparison of figures 11(a) and 11(b) indicates that the load on the launch-vehicle upper stage immediately behind the winged reentry glider does not vary appreciably with angle of attack. This lack of variation is probably due to the large influence of separation on the upper-surface pressure coefficients on the forward portion of the upper stage. The separated flow reduces the negative pressure coefficients on the upper-stage upper surface, so that the positive resultant section loads are reduced and in some cases resultant section loads become negative.

Figure 12 shows a comparison of the launch-vehicle section normal-force coefficient distribution for this launch-vehicle configuration with that of a similar launch vehicle having a conical nose with a 15.3° half-angle. (See configuration 4 of ref. 2.) The primary difference in the launch-vehicle section normal-force coefficients for the two configurations is in the load carryover to the forward portion of the upper stage at the higher Mach numbers. That is, the resultant normal-force on the forward portion of the upper stage resulting from the flow over the conical nose is noticeably greater than that resulting from the flow over the winged reentry glider.

CONCLUDING REMARKS

An investigation has been conducted at transonic speeds to determine the static aerodynamic loading characteristics of a typical winged reentry glider in combination with a simulated launch vehicle.

The results of the investigation indicate that interference effects associated with the asymmetrical geometry of the winged reentry glider cause changes in the type of flow (separated or attached) circumferentially about the

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launch-vehicle upper stage. These variations in the type of flow over the launch vehicle and, hence, in the launch-vehicle surface-pressure coefficients, generally extend approximately 2.5 upper-stage diameters behind the rear corner of the conical fairing. As a probable result of the flow separation, section normal-force coefficients on the launch-vehicle upper stage immediately behind the winged reentry glider do not vary appreciably with angle of attack.

Comparison of the section normal-force coefficient distributions for the launch vehicle in the present winged reentry glider configuration with that for a similar launch vehicle having a conical nose with a 15.3° half-angle shows the resultant normal force on the forward portion of the launch-vehicle upper stage resulting from the loads carryover of the winged reentry glider to be noticeably lower than that associated with the conical nose.

Langley Research Center,
National Aeronautics and Space Administration,
Langley Station, Hampton, Va., October 16, 1964.

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(Supersedes NACA TN 4201.)

TABLE I.- SURFACE PRESSURE COEFFICIENTS FOR WINGED REENTRY GLIDER

(a) $M = 0.75$ to 0.95 ; $\alpha = 0^\circ$

Orifice	Upright			Inverted		
	$M = 0.75$	C_p for - $M = 0.85$	$M = 0.90$	$M = 0.75$	C_p for - $M = 0.85$	$M = 0.90$
1	0.177	0.200	0.214	0.176	0.202	0.220
2	.174	.200	.214	.175	.202	.219
3	.026	.064	.091	.139	.025	.066
4	.015	.057	.087	.134	.016	.060
5	.023	.065	.093	.139	.021	.064
6	.027	.065	.093	.137	.023	.062
7	-.181	-.189	-.585	-.524	-.159	-.193
8	-.205	-.216	-.721	-.624	-.210	-.209
9	-.205	-.221	-.719	-.625	-.209	-.213
10	-.176	-.157	-.494	-.433	-.172	-.146
11	-.341	-.382	-.418	-.536	-.369	-.401
Wing						
12	.180	.200	.212	.242	.165	.188
14	-.162	-.137	-.108	-.295	-.174	-.145
15	.181	.203	.213	.246	.15	.183
16	.078	.093	.103	.140	.076	.091
17	-.023	-.028	-.050	-.071	-.025	-.028
18	.186	.209	.222	.253	.18	.198
19	.046	.076	.095	.137	.19	.062
20	-.173	-.149	-.232	-.415	-.20	-.149
21	-.306	-.338	-.369	-.479	-.311	-.343
Body						
12						
14						
15						
16						
17						
18						
19						
20						
21						

TABLE I.- SURFACE PRESSURE COEFFICIENTS FOR WINGED REENTRY GLIDER - Continued

(b) $M = 0.60$; $\alpha = -10^\circ$ to 10°

Orifice	C _p for -					C _p for -								
	$\alpha = -10^\circ$	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	$\alpha = 10^\circ$	$\alpha = -10^\circ$	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	$\alpha = 10^\circ$
1	-0.032	0.041	0.100	0.153	0.217	0.286	0.381	1	0.374	0.288	0.221	0.162	0.099	0.041
2	-.029	.041	.096	.152	.217	.287	.383	2	.375	.288	.222	.161	.096	.038
3	-.184	-.109	-.048	-.002	.063	.128	.220	3	.210	.150	.070	.009	-.057	-.110
4	-.17	-.108	-.057	-.011	.049	.112	.206	4	.199	.116	.055	-.002	-.057	-.110
5	-.166	-.102	-.050	-.002	.061	.125	.216	5	.207	.125	.062	.005	.053	-.105
6	-.190	-.111	-.056	-.003	.065	.134	.222	6	.215	.129	.061	.010	.060	-.116
7	-.303	-.251	-.209	-.176	-.135	-.087	-.018	7	.030	.089	.135	.150	.180	-.256
8	-.294	-.260	-.229	-.200	-.163	-.119	-.054	8	.062	.121	.163	.199	.235	-.265
9	-.301	-.260	-.232	-.202	-.162	-.119	-.058	9	.058	.118	.160	.197	.232	-.263
10	-.303	-.249	-.203	-.169	-.124	-.077	-.007	10	.008	.067	.117	.154	.186	-.247
11	-.365	-.336	-.328	-.325	-.330	-.347	-.397	11	-.414	-.375	-.372	-.361	-.366	-.364
12	-.189	-.189	-.181	-.157	-.118	-.060	-.034	12	-.030	.068	.115	.150	.177	.196
14	-.146	-.154	-.159	-.169	-.183	-.204	-.219	14	-.224	-.201	-.187	-.174	-.163	-.150
15	.350	.270	.217	.163	.111	.060	.006	15	.007	.068	.117	.166	.219	.272
16	.245	.169	.118	.067	.022	-.022	-.065	16	-.064	.015	.024	.070	.118	.249
17	.124	.061	.020	-.022	-.053	-.086	-.112	17	-.112	-.081	-.053	-.020	.018	.063
18	.225	.220	.201	.166	.131	.084	-.016	18	-.014	.092	.140	.182	.205	.201
19	.067	.067	.053	.030	.009	-.017	-.081	19	-.072	.009	.021	.051	.064	.066
20	-.138	-.146	-.161	-.177	-.191	-.206	-.214	20	-.199	-.177	-.166	-.147	-.138	-.135
21	-.256	-.276	-.287	-.289	-.284	-.280	-.273	21	-.270	-.278	-.278	-.291	-.291	-.253

TABLE I.- SURFACE PRESSURE COEFFICIENTS FOR WINGED REENTRY GLIDER - Continued

(c) $M = 0.8$; $\alpha = -6^\circ$ to 6°

Orifice	Cp for -				Cp for -			
	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$
Wing								
1	0.070	0.122	0.184	0.249	0.321	1	0.318	0.187
2	.067	.119	.184	.250	.322	2	.319	.187
3	-.072	-.020	.039	.098	.163	3	.162	.103
4	-.070	-.023	.031	.089	.152	4	.151	.092
5	-.064	-.017	.039	.097	.162	5	.159	.098
6	-.075	-.023	.039	.099	.169	6	.162	.094
7	-.252	-.206	-.168	-.132	-.089	7	-.092	-.133
8	-.254	-.214	-.183	-.154	-.115	8	-.119	-.154
9	-.255	-.217	-.184	-.152	-.115	9	-.116	-.152
10	-.246	-.196	-.168	-.105	-.079	10	-.060	-.097
11	-.375	-.367	-.357	-.361	-.378	11	-.406	-.384
Body								
12	.218	.203	.186	.143	.086	12	.091	.141
14	-.150	-.157	-.158	-.173	-.193	14	-.189	-.176
15	.200	.240	.190	.135	.085	15	.089	.138
16	.191	.132	.083	.030	-.018	16	-.013	.033
17	.065	.014	-.025	-.066	-.099	17	-.094	-.062
18	.251	.226	.195	.158	.112	18	.118	.166
19	.097	.078	.058	.036	.002	19	.011	.043
20	-.143	-.158	-.167	-.177	-.187	20	-.163	-.156
21	-.310	-.323	-.319	-.310	-.307	21	-.310	-.318

TABLE I.- SURFACE PRESSURE COEFFICIENTS FOR WINGED REENTRY GLIDER - Continued

(d) $M = 1.00; \alpha = -6^\circ$ to 6°

Orifice	C _p for -				C _p for -					
	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$
Upright										
1	0.194	0.248	0.303	0.365	0.431	1	0.429	0.365	0.304	0.243
2	.187	.247	.304	.369	.434	2	.431	.366	.303	.242
3	.095	.153	.205	.260	.313	3	.313	.262	.207	.149
4	.103	.154	.201	.255	.305	4	.307	.256	.204	.150
5	.104	.155	.205	.260	.315	5	.312	.259	.205	.153
6	.090	.148	.205	.260	.317	6	.312	.255	.202	.144
7	.513	.471	.430	.374	.304	7	.305	.367	.424	.492
8	.588	.555	.518	.469	.411	8	.417	.473	.522	.561
9	.589	.555	.519	.470	.410	9	.413	.470	.518	.558
10	.463	.405	.342	.295	.187	10	.268	.351	.333	.402
11	.608	.563	.529	.531	.551	11	.560	.540	.540	.597
Wing										
12	.328	.317	.296	.254	.201	12	.207	.256	.292	.317
14	.063	.179	.235	.319	.393	14	.389	.324	.250	.177
15	.405	.350	.298	.245	.198	15	.204	.253	.307	.359
16	.306	.253	.201	.150	.104	16	.110	.157	.208	.257
17	.129	.060	.004	.068	.121	17	.115	.061	.003	.065
18	.358	.337	.304	.269	.229	18	.236	.281	.323	.348
19	.234	.223	.201	.175	.142	19	.152	.186	.217	.230
20	.161	.290	.344	.399	.454	20	.447	.383	.315	.268
21	.546	.537	.523	.511	.497	21	.501	.515	.526	.539
Body										
Inverted										
1	0.190	0.188	0.094	0.101	0.101	2	0.242	0.242	0.094	0.094
3	0.149	0.149	0.150	0.150	0.150	4	0.153	0.153	0.153	0.153
5	0.087	0.087	0.518	0.518	0.518	6	0.591	0.591	0.591	0.591
7	0.558	0.558	0.451	0.451	0.451	8	0.402	0.402	0.402	0.402
9	0.628	0.628	0.597	0.597	0.597	10	0.597	0.597	0.597	0.597

TABLE I.- SURFACE PRESSURE COEFFICIENTS FOR WINGED REENTRY GLIDER - Concluded

(e) $M = 1.20; \alpha = -6^\circ$ to 6°

Orifice	C _p for -			C _p for -		
	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	$\alpha = 30^\circ$
1	0.211	0.255	0.302	0.368	0.444	0.440
2	.207	.254	.304	.373	.448	.444
3	.187	.242	.296	.359	.425	.427
4	.194	.242	.294	.356	.422	.423
5	.192	.240	.294	.357	.425	.426
6	.177	.232	.293	.359	.427	.428
7	.254	.228	.206	.176	.133	.131
8	.299	.272	.246	.213	.173	.173
9	.300	.275	.249	.216	.175	.172
10	.210	.172	.130	.088	.046	.033
11	.400	.385	.363	.380	.400	.404
12	.330	.321	.299	.264	.221	.224
14	.129	.103	.103	.148	.201	.14
15	.409	.354	.305	.261	.225	.15
16	.398	.336	.286	.238	.197	.16
17	.278	.221	.169	.118	.081	.17
18	.371	.349	.318	.288	.250	.18
19	.335	.316	.293	.269	.243	.19
20	.182	.175	.180	.205	.242	.20
21	.351	.361	.361	.369	.367	.21
Wing						
Body						

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TABLE II-- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE

(a) $M = 0.75$ to 0.95 ; $\alpha = 0^\circ$; $\phi = 0^\circ$

		Upright						Inverted			
		C_p for -						C_p for -			
		$M=0.75$	$M=0.85$	$M=0.90$	$M=0.95$			$M=0.75$	$M=0.85$	$M=0.90$	$M=0.95$
Conical fairing	Upper stage	11.51	-0.335	-0.380	-0.424	-0.531	11.51	0.074	0.033	-0.022	-0.127
		12.01	-.300	-.356	-.409	-.513	12.01	.034	.013	-.003	-.153
		12.51	-.179	-.248	-.323	-.420	12.51	-.420	-.573	-.579	-.517
		13.01	-.072	-.119	-.192	-.291	13.01	-.044	-.040	-.022	-.196
		13.51	.023	.010	-.045	-.145	13.51	-.013	-.006	.002	.038
		14.01	.049	.065	.050	-.012	14.01	-.007	-.002	.004	.032
		14.51	.041	.065	.071	.057	14.51	-.001	.002	.007	.031
		15.01	.029	.050	.061	.075	15.01	0	.003	.007	.029
		15.51	.023	.038	.047	.072	15.51	.006	.008	.011	.031
		16.01	.013	.025	.029	.055	16.01	.003	.005	.007	.024
		17.01	.007	.016	.014	.030	17.01	.005	.007	.008	.019
		18.01	.008	.015	.009	.019	18.01	.008	.010	.010	.017
		19.01	.014	.021	.015	.021	19.01	.015	.016	.015	.022
		21.01	.030	.039	.035	.042	21.01	.032	.035	.035	.042
		23.01	.195	.220	.217	.225	23.01	.209	.220	.234	.264
Transition flare	Upper stage	24.09	.059	.074	.072	.084	24.09	.073	.078	.083	.100
		24.59	.034	.046	.043	.054	24.59	.043	.047	.050	.065
		25.59	.009	.018	.012	.022	25.59	.016	.017	.019	.032
		26.59	-.017	-.013	-.021	-.010	26.59	-.009	-.012	-.012	.002
		27.59	-.066	-.068	-.083	-.073	27.59	-.063	-.073	-.075	-.047
		28.09	-.143	-.161	-.193	-.196	28.09	-.152	-.183	-.208	-.162
Main stage	Upper stage	28.39	-.183	-.218	-.270	-.401	28.39	-.195	-.236	-.336	-.374
		28.85	-.091	-.100	-.121	-.238	28.85	-.092	-.107	-.118	-.335
		29.35	-.059	-.064	-.079	-.122	29.35	-.058	-.067	-.072	-.217
		29.85	-.043	-.044	-.057	-.064	29.85	-.040	-.046	-.050	-.046
		30.35	-.034	-.034	-.044	-.042	30.35	-.030	-.036	-.039	-.016
		30.85	-.027	-.026	-.036	-.031	30.85	-.024	-.028	-.031	-.013
		31.35	-.023	-.020	-.031	-.029	31.35	-.021	-.025	-.026	-.015
		31.85	-.018	-.016	-.026	-.024	31.85	-.017	-.019	-.022	-.015
		32.85	-.012	-.009	-.019	-.019	32.85	-.009	-.013	-.015	-.012
		33.85	-.010	-.006	-.016	-.018	33.85	-.007	-.011	-.014	-.015
		34.85	-.008	-.004	-.013	-.016	34.85	-.005	-.008	-.011	-.012
		36.85	-.007	-.002	-.011	-.014	36.85	-.004	-.006	-.008	-.011
		38.85	-.004	.001	-.007	-.011	38.85	-.001	-.002	-.004	-.007
		39.24	-.001	.001	-.008	-.011	39.24	.002	-.001	-.002	-.004
		40.85		.003	-.005	-.009	40.85	0	-.002	-.004	-.006
		42.85	-.004	-.001	-.009	-.013	42.85	-.003	-.005	-.007	-.011
		43.85	-.004	0	-.009	-.013	43.85	-.002	-.004	-.006	-.009
		44.85	-.007	-.003	-.012	-.016	44.85	-.005	-.007	-.010	-.013

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(b) $M = 0.75$ to 0.95 ; $\alpha = 0^\circ$; $\phi = 30^\circ$

		Upright						Inverted			
		C_p for -						C_p for -			
		x , in.	$M=0.75$	$M=0.85$	$M=0.90$	$M=0.95$	x , in.	$M=0.75$	$M=0.85$	$M=0.90$	$M=0.95$
Conical fairing	Upper stage	12.51	-0.210	-0.283	-0.361	-0.442	12.51	-0.327	-0.420	-0.518	-0.480
		13.01	.008	-.044	-.148	-.237	13.01	-.019	-.011	-----	-.115
		13.51	.077	.081	.026	-.064	13.51	-.008	.001	.009	.028
		14.01	.067	.094	.090	.052	14.01	-.001	.005	.010	.033
		14.51	.044	.070	.082	.085	14.51	0	.004	.010	.032
		15.01	.029	.051	.061	.082	15.01	.002	.006	.011	.033
		15.51	.022	.038	.044	.070	15.51	.005	.009	.012	.033
		16.01	.013	.025	.027	.051	16.01	.003	.006	.008	.026
		17.01	.009	.018	.014	.029	17.01	.006	.008	.009	.021
		18.01	.012	.021	.014	.023	18.01	.013	.014	.013	.022
Transition flare	Main stage	19.01	.011	.021	.014	.019	19.01	.013	.014	.013	.021
		21.01	.030	.043	.036	.044	21.01	.034	.037	.038	.045
		23.01	.198	.225	.224	.235	23.01	.203	.216	.226	.255
		24.09	.060	.075	.072	.086	24.09	.070	.075	.079	.097
		24.59	.033	.046	.043	.055	24.59	.043	.046	.049	.063
		25.59	.008	.018	.013	.024	25.59	.014	.016	.018	.030
		26.59	-.016	-.010	-.019	-.007	26.59	-.011	-.013	-.011	.003
		27.59	-.065	-.067	-.081	-.068	27.59	-.062	-.071	-.075	-.048
		28.09	-.142	-.160	-.188	-.178	28.09	-.145	-.173	-.196	-.153
		28.39	-.191	-.230	-.295	-.416	28.39	-.194	-.231	-.331	-.382
Main stage	Transition flare	28.85	-.091	-.100	-.121	-.258	28.85	-.093	-.106	-.119	-.344
		29.35	-.060	-.066	-.080	-.121	29.35	-.061	-.068	-.075	-.190
		29.85	-.045	-.046	-.058	-.064	29.85	-.044	-.048	-.053	-.051
		30.35	-.034	-.034	-.045	-.041	30.35	-.032	-.036	-.040	-.020
		30.85	-.027	-.028	-.037	-.033	30.85	-.026	-.028	-.033	-.016
		31.35	-.025	-.023	-.032	-.030	31.35	-.023	-.025	-.028	-.019
		31.85	-.021	-.019	-.027	-.026	31.85	-.019	-.021	-.024	-.017
		32.85	-.012	-.011	-.019	-.020	32.85	-.012	-.013	-.016	-.014
		33.85	-.011	-.008	-.017	-.019	33.85	-.010	-.011	-.014	-.015
		34.85	-.007	-.004	-.013	-.016	34.85	-.006	-.008	-.011	-.012
Conical fairing	Main stage	36.85	-.003	-----	-.009	-.012	36.85	-.003	-.004	-.006	-.008
		38.85	.002	.004	-.004	-.007	38.85	.002	.001	-----	-.002
		39.24	-.002	-----	-.009	-.012	39.24	0	-.001	-.003	-.005
		40.85	-.001	.003	-.006	-.009	40.85	-.001	-.001	-.005	-.008
		42.85	-.006	-.002	-.010	-.015	42.85	-.006	-.006	-.010	-.013
		43.85	-.007	-.003	-.011	-.016	43.85	-.006	-.006	-.010	-.013
		44.85	-.009	-.004	-.013	-.019	44.85	-.009	-.008	-.013	-.016
		45.85	-.009	-.004	-.013	-.018	45.85	-.008	-.008	-.013	-.015
		47.85	-.021	-.019	-.027	-.034	47.85	-.021	-.022	-.025	-.028
		49.85	-.081	-.082	-.095	-.110	49.85	-.079	-.085	-.093	-.105

TABLE II.-- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(c) $M = 0.75$ to 0.95 ; $\alpha = 0^\circ$; $\phi = 60^\circ$

		Upright						Inverted				
Upper stage	Conical fairing	x, in.	C_p for -				Conical fairing	x, in.	C_p for -			
			M=0.75	M=0.85	M=0.90	M=0.95			M=0.75	M=0.85	M=0.90	M=0.95
Main stage	Transition flare	12.51	-0.230	-0.270	-0.357	-0.463		12.51	-0.049	-0.058	-0.149	-0.294
		13.01	.005	.008	-.028	-.104		13.01	-.018	-.012	-.020	-.111
		13.51	.021	.040	.029	.002		13.51	-.021	-.014	-.006	-.031
		14.01	.019	.039	.042	.039		14.01	-.015	-.010	.002	.008
		14.51	.015	.033	.039	.053		14.51	-.011	-.006	-.005	.023
		15.01	.010	.026	.030	.052		15.01	-.006	-.003	.007	.028
		15.51	.009	.023	.025	.047		15.51	-.002	.002	.010	.031
		16.01	.005	.016	.015	.036		16.01	-.004	-.001	.005	.025
		17.01	.006	.016	.009	.022		17.01	.002	.004	.007	.021
		18.01	.007	.017	.008	.016		18.01	.008	.009	.010	.018
		19.01	.009	.020	.010	.017		19.01	.013	.014	.014	.020
		21.01	.027	.039	.032	.040		21.01	.032	.034	.036	.041
		23.01	.182	.207	.204	.220		23.01	.211	.225	.240	.259
		24.09	.056	.070	.065	.079		24.09	.064	.069	.075	.089
		24.59	.032	.044	.040	.052		24.59	.040	.045	.049	.060
		25.59	.007	.017	.010	.021		25.59	.015	.017	.020	.030
		26.59	-.020	-.015	-.024	-.011		26.59	-.012	-.014	-.015	-.001
		27.59	-.072	-.074	-.090	-.075		27.59	-.064	-.073	-.079	-.060
		28.09	-.139	-.157	-.185	-.177		28.09	-.133	-.157	-.181	-.150
		28.39	-.209	-.251	-.312	-.436		28.39	-.217	-.264	-.384	-.422
		28.85	-.089	-.099	-.121	-.271		28.85	-.090	-.102	-.117	-.308
		29.35	-.061	-.066	-.081	-.129		29.35	-.063	-.071	-.080	-.161
		29.85	-.043	-.045	-.056	-.063		29.85	-.044	-.048	-.055	-.061
		30.35	-.032	-.033	-.043	-.039		30.35	-.034	-.037	-.043	-.030
		30.85	-.026	-.028	-.036	-.033		30.85	-.029	-.031	-.036	-.025
		31.35	-.023	-.022	-.030	-.029		31.35	-.024	-.026	-.031	-.023
		31.85	-.014	-.013	-.022	-.022		31.85	-.016	-.017	-.022	-.017
		32.85	-.010	-.009	-.016	-.019		32.85	-.012	-.012	-.017	-.016
		33.85	-.009	-.008	-.016	-.019		33.85	-.011	-.011	-.016	-.018
		34.85	-.003	-.002	-.010	-.014		34.85	-.005	-.004	-.009	-.010
		36.85	-.001	.001	-.006	-.012		36.85	-.002	-.001	-.007	-.009
		38.85	.002	.004	-.004	-.009		38.85	.001	.002	-.003	-.006
		39.24	-.001	-.001	-.009	-.015		39.24	-.002	-.002	-.006	-.009
		40.85	.002	.003	-.005	-.010		40.85	0	.001	-.003	-.006
		42.85	-.003	-.001	-.009	-.014		42.85	-.005	-.004	-.009	-.012
		43.85	-.003	-.002	-.010	-.015		43.85	-.005	-.003	-.009	-.012
		44.85	-.003	-.002	-.011	-.016		44.85	-.007	-.005	-.011	-.014
		45.85	-.008	-.006	-.014	-.019		45.85	-.011	-.009	-.014	-.019
		47.85	-.018	-.017	-.026	-.031		47.85	-.020	-.021	-.025	-.028
		49.85	-.080	-.083	-.096	-.109		49.85	-.082	-.084	-.094	-.106

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(a) $M = 0.75$ to 0.95 ; $\alpha = 0^\circ$; $\phi = 90^\circ$

		Upright						Inverted			
		C_p for -						C_p for -			
		M=0.75	M=0.85	M=0.90	M=0.95			M=0.75	M=0.85	M=0.90	M=0.95
Main stage	Conical fairing	11.51	-0.175	-0.267	-0.341	-0.397	11.51	-0.191	-0.283	-0.330	-0.402
	Upper stage	12.01	.138	.070	-.011	-.140	12.01	.138	.028	-.063	-.175
	Transition flare	12.51	-.234	-.237	-.334	-.513	12.51	-.194	-.180	-.259	-.513
	Conical fairing	13.51	.002	.016	.007	.008	13.51	.005	.010	.006	-.013
	Upper stage	14.51	.002	.012	.004	.029	14.51	.001	.003	.003	.021
	Transition flare	15.51	.003	.012	.004	.026	15.51	.002	.002	.004	.026
	Conical fairing	17.01	.004	.012	.004	.015	17.01	.005	.003	.003	.018
	Upper stage	19.01	.008	.017	.007	.013	19.01	.008	.009	.007	.014
	Transition flare	21.01	.025	.038	.030	.038	21.01	.028	.032	.031	.039
	Conical fairing	23.01	.181	.199	.200	.214	23.01	.175	.188	.206	.228
Main stage	Upper stage	24.09	.054	.066	.065	.078	24.09	.056	.060	.064	.078
	Transition flare	25.29	.007	.015	.009	.020	25.59	.008	.009	.009	.020
	Conical fairing	27.59	-.067	-.072	-.085	-.070	27.59	-.065	-.075	-.082	-.068
	Upper stage	28.39	-.185	-.214	-.270	-.432	28.39	-.190	-.225	-.295	-.460
	Transition flare	29.35	-.061	-.067	-.084	-.144	29.35	-.067	-.073	-.084	-.152
	Conical fairing	30.35	-.032	-.034	-.044	-.038	30.35	-.036	-.039	-.044	-.039
	Upper stage	31.35	-.020	-.021	-.028	-.024	31.35	-.025	-.024	-.030	-.025
	Transition flare	32.85	-.010	-.010	-.018	-.020	32.85	-.016	-.015	-.020	-.020
	Conical fairing	34.85	-.007	-.005	-.013	-.016	34.85	-.012	-.010	-.014	-.017
	Upper stage	36.85	-.002	-----	-.008	-.012	36.85	-.006	-.004	-.010	-.012
	Transition flare	38.85	-----	.002	-.005	-.011	38.85	-.005	-.003	-.007	-.011
	Conical fairing	39.24	0	-----	-.007	-.011	39.24	-.005	-.004	-.009	-.011
	Upper stage	40.85	.003	.006	-.001	-.006	40.85	-.001	.002	-.002	-.006
	Transition flare	42.85	-.003	-.001	-.009	-.013	42.85	-.007	-.006	-.010	-.014
	Conical fairing	44.85	-.005	-.003	-.011	-.017	44.85	-.010	-.009	-.013	-.018

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - continued

(e) $M = 0.60$; $\alpha = -10^\circ$ to 10° ; $\beta = 0^\circ$

x, in.		Upright					Inverted				
		C_p for -		C_p for -			C_p for -		C_p for -		
$\alpha = -10^\circ$	$\alpha = 6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 6^\circ$	$\alpha = -10^\circ$	$\alpha = 6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = -3^\circ$
11.51	-0.345	-0.329	-0.315	-0.302	-0.298	-0.300	0.141	0.120	0.095	0.085	0.090
12.01	-0.264	-0.276	-0.272	-0.263	-0.263	-0.255	0.063	0.049	0.031	0.027	0.024
12.51	-0.159	-0.158	-0.148	-0.142	-0.143	-0.147	0.084	0.052	-0.358	-0.360	-0.376
13.01	.040	-.007	-.024	-.032	-.029	-.031	-.003	-.029	-.041	-.047	-.050
13.51	.084	.046	.034	.032	.042	.049	.068	.001	.012	.017	.021
14.01	.070	.042	.036	.041	.056	.063	.072	.008	.002	.008	.016
14.51	.056	.035	.028	.033	.047	.050	.054	.016	.004	.002	.026
15.01	.046	.025	.019	.025	.034	.034	.036	.020	.007	.002	.025
15.51	.045	.023	.017	.020	.028	.026	.024	.028	.014	.008	.021
16.01	.040	.017	.009	.014	.020	.016	.012	.027	.011	.005	.009
16.51	.018	.010	.012	.014	.014	.009	.005	.032	.015	.008	.025
17.01	.041	.021	.012	.014	.017	.009	.002	.037	.019	.010	.021
17.51	.042	.026	.020	.018	.021	.014	.004	.047	.027	.017	.018
18.01	.050	.026	.012	.012	.014	.017	.009	.037	.019	.003	.010
19.01	.066	.042	.033	.032	.033	.024	.011	.064	.044	.035	.007
20.01	.288	.221	.193	.187	.188	.181	.178	.23.01	.263	.227	.185
21.01	.095	.075	.057	.050	.035	.035	.020	.24.09	.145	.107	.064
22.01	.118	.072	.050	.033	.026	.009	.008	.24.59	.120	.080	.039
23.01	.097	.050	.029	.010	.002	.014	.031	.25.59	.100	.058	.016
24.09	.072	.027	.003	.016	.021	.021	.035	.26.59	.074	.032	.009
25.09	.075	.020	.021	.040	.058	.065	.076	.27.59	.022	.018	.044
26.09	.27.59	.100	.069	.108	.123	.127	.143	.28.09	.069	.107	.127
27.09	.069	.100	.069	.108	.123	.127	.143				
28.09											
28.39	-1.38	-1.54	-1.48	-1.58	-1.54	-1.57	-1.75	28.39	-1.37	-1.77	-1.61
28.85	-0.36	-0.67	-0.69	-0.76	-0.74	-0.84	-0.99	28.85	-0.34	-0.62	-0.78
29.35	-0.10	-0.57	-0.66	-0.51	-0.50	-0.58	-0.72	29.35	-0.34	-0.51	-0.61
29.85	.002	.024	.029	.057	.053	.042	.052	29.85	.003	.021	.048
30.35	.009	.016	.023	.023	.029	.026	.034	30.35	.010	.013	.045
30.85	.013	.011	.011	.011	.017	.022	.020	30.85	.016	.007	.027
31.35	.016	.008	.012	.017	.017	.017	.025	31.35	.017	.005	.021
31.85	.020	.003	.008	.015	.011	.020	.028	31.85	.022	.011	.017
32.35	.027	.005	.003	.009	.013	.006	.019	32.35	.029	.006	.007
32.85	.027	.006	.002	.006	.012	.017	.017	33.85	.029	.007	.003
33.85	.027	.007	.001	.004	.010	.014	.010	34.85	.032	.011	.003
34.85	.029	.007	.001	.004	.004	.004	.004				
36.85	.030	.009	.004	.002	.001	.008	.013				
38.85	.034	.013	.006	.005	.001	.010	.004				
39.24	.037	.015	.006	.005	.003	.005	.011				
40.85	.038	.015	.007	.001	.005	.005	.011				
42.85	.032	.011	.004	.002	.002	.007	.017				
43.85	.034	.011	.006	.002	.002	.006	.018				
44.85	.029	.008	.002	.005	.002	.002	.010				

TABLE II. - SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(r) $M = 0.60$; $\alpha = -10^\circ$ to 10° ; $\phi = 30^\circ$

		Upright						Inverted						
		C_p for -			C_p for -			C_p for -			C_p for -			
x, in.	$\alpha = -10^\circ$	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	$\alpha = 10^\circ$	$\alpha = -10^\circ$	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	$\alpha = 10^\circ$
12.51	-0.057	-0.080	-0.128	-0.158	-0.174	-0.177	-0.159	.016	.015	.014	.013	.012	.011	.010
13.01	.121	.095	.067	.047	.038	.030	.020	.020	.020	.020	.019	.018	.017	.016
13.51	.099	.086	.055	.056	.052	.054	.045	.032	.025	.024	.021	.018	.012	.009
14.01	.067	.045	.039	.036	.037	.036	.020	.012	.012	.013	.014	.009	.005	.002
14.51	.036	.028	.026	.026	.026	.026	.012	.004	.004	.008	.008	.005	.002	.002
15.01	.024	.020	.020	.020	.020	.020	.008	.002	.002	.002	.001	0	.001	.001
15.51	.024	.020	.019	.019	.019	.019	.014	.001	.001	.003	.003	.004	.003	.003
16.01	.024	.020	.019	.019	.019	.019	.012	.001	.001	.004	.004	.003	.003	.003
16.51	.022	.019	.019	.019	.019	.019	.012	.001	.001	.012	.010	.007	.006	.006
17.01	.022	.022	.017	.017	.015	.015	.016	.002	.002	.010	.016	.014	.012	.010
17.51	.026	.023	.016	.016	.016	.016	.016	.002	.002	.012	.020	.015	.014	.013
18.01	.027	.023	.016	.016	.016	.016	.016	.002	.002	.012	.021	.017	.016	.016
19.01	.027	.024	.017	.017	.017	.017	.017	.001	.001	.017	.023	.017	.017	.017
21.01	.046	.217	.195	.189	.172	.172	.148	.140	.140	.140	.257	.234	.206	.189
23.01	.245													
24.09	.110	.086	.074	.058	.050	.051	.051	.008	.008	.009	.110	.090	.069	.061
24.59	.085	.062	.045	.034	.026	.012	.012	.017	.017	.017	.24.59	.088	.064	.043
25.09	.064	.041	.031	.026	.026	.026	.026	.017	.017	.017	.25.59	.066	.043	.035
26.09	.041	.021	.013	.013	.013	.013	.013	.017	.017	.017	.26.59	.040	.022	.012
27.09	.032	.014	.012	.012	.012	.012	.012	.017	.017	.017	.27.59	.019	.001	.012
28.09	.006	.108	.108	.110	.110	.110	.110	.153	.153	.153	.28.09	.005	.030	.012
28.39	.157	.162	.157	.162	.162	.162	.161	.172	.172	.172	.28.39	.157	.170	.173
28.85	.062	.074	.074	.073	.078	.076	.076	.087	.087	.087	.28.85	.062	.072	.078
29.35	.029	.049	.049	.048	.052	.051	.051	.061	.070	.070	.29.35	.039	.047	.052
29.85	.026	.034	.034	.035	.038	.035	.035	.047	.054	.054	.29.85	.026	.032	.038
30.35	.018	.025	.025	.025	.029	.029	.029	.057	.057	.057	.30.35	.018	.022	.027
30.85	.014	.021	.021	.021	.021	.021	.021	.020	.020	.020	.30.85	.013	.018	.021
31.35	.010	.019	.019	.019	.019	.019	.019	.017	.017	.017	.31.35	.012	.016	.018
31.85	.006	.015	.015	.015	.017	.017	.017	.024	.024	.024	.31.85	.007	.012	.014
32.35	.002	.006	.006	.006	.006	.006	.006	.018	.018	.018	.32.35	.002	.004	.006
33.85	.001	.007	.007	.007	.007	.007	.007	.015	.015	.015	.33.85	.001	.005	.008
34.35	.005	.002	.002	.002	.002	.002	.002	.011	.011	.011	.34.35	.004	.001	.005
35.85	.009	.003	.003	.003	.003	.003	.003	.004	.004	.004	.35.85	.008	.003	.003
36.35	.016	.016	.016	.016	.017	.017	.017	.024	.024	.024	.36.35	.017	.012	.012
37.85	.006	.002	.002	.002	.002	.002	.002	.007	.007	.007	.37.85	.006	.002	.004
39.24	.006	.006	.006	.006	.006	.006	.006	.007	.007	.007	.39.24	.005	.003	.003
40.85	.009	.005	.005	.005	.005	.005	.005	.005	.005	.005	.40.85	.008	.001	.003
42.85	.003	.001	.001	.001	.001	.001	.001	.001	.001	.001	.42.85	.001	.003	.003
43.85	.003	.002	.002	.002	.002	.002	.002	.003	.003	.003	.43.85	0	.002	.002
44.85	.004	.007	.007	.007	.007	.007	.007	.012	.012	.012	.44.85	.003	.005	.005
45.85	.002	.004	.004	.004	.004	.004	.004	.028	.028	.028	.45.85	.001	.004	.004
47.85	.014	.016	.016	.017	.020	.019	.019	.042	.042	.042	.47.85	.017	.017	.017
49.85	.097	.080	.075	.076	.080	.080	.080	.117	.117	.117	.49.85	.078	.072	.072

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(g) $M = 0.60; \alpha = -10^\circ$ to $10^\circ; \phi = 60^\circ$

x, in.	Upright				Inverted			
	$\alpha = -10^\circ$	$\alpha = -6^\circ$	$\alpha = -2^\circ$	$\alpha = 0^\circ$	$\alpha = 2^\circ$	$\alpha = 6^\circ$	$\alpha = 10^\circ$	$\alpha = 10^\circ$
12.51	0.034	-0.101	-0.162	-0.209	-0.252	-0.302	-0.352	
13.01	.060	.046	.029	.009	-.011	-.045	-.077	
13.51	.022	.036	.026	.020	.017	.010	.019	
14.01	-.013	.020	.019	.014	.013	.011	.013	
14.51	-.019	.018	.014	.013	.011	.010	.010	
15.01	-.019	.005	.010	.011	.011	.009	.009	
15.51	-.020	.004	.011	.012	.012	.007	.006	
16.01	-.029	0	.005	.009	.009	.011	.011	
17.01	-.025	.002	.006	.010	.010	.006	.028	
18.01	-.024	.003	.008	.012	.012	.004	.026	
19.01	-.022	.005	.012	.016	.015	0	.020	
21.01	-.007	.022	.027	.029	.031	.013	.013	
23.01	.171	.192	.191	.175	.181	.166	.113	
24.09	.033	.052	.061	.054	.050	.027	.003	
24.59	.013	.032	.040	.033	.031	.005	.021	
25.59	-.008	.010	.017	.010	.007	.017	.017	
26.59	-.034	.017	-.009	-.015	-.015	-.018	-.014	
27.59	-.085	.068	-.059	-.065	-.065	-.086	-.109	
28.09	-.149	-.129	-.118	-.119	-.120	-.136	-.155	
28.39	-.243	-.208	-.190	-.180	-.179	-.170	-.182	
28.85	-.118	-.090	-.079	-.077	-.076	-.086	-.099	
29.35	-.098	-.069	-.056	-.054	-.054	-.064	-.075	
29.85	-.083	-.083	-.052	-.054	-.054	-.047	-.057	
30.35	-.074	-.074	-.062	-.059	-.059	-.039	-.051	
30.85	-.070	-.059	-.025	-.024	-.024	-.032	-.047	
31.35	-.068	-.035	-.022	-.019	-.019	-.028	-.043	
31.85	-.059	-.028	-.015	-.011	-.011	-.021	-.036	
32.35	-.056	-.025	-.011	-.008	-.007	-.019	-.025	
32.85	-.056	-.025	-.011	-.008	-.007	-.011	-.026	
33.35	-.056	-.024	-.011	-.008	-.007	-.016	-.026	
33.85	-.038	-.013	0	-.005	-.005	-.016	-.034	
34.35	-.047	-.016	-.002	-.004	-.001	-.014	-.030	
35.85	-.047	-.016	-.004	-.001	-.001	-.009	-.026	
36.35	-.043	-.014	-.001	-.006	-.004	-.007	-.026	
36.85	-.043	-.014	0	-.004	-.001	-.001	-.026	
37.35	-.043	-.014	0	-.004	-.001	-.001	-.026	
37.85	-.043	-.014	0	-.004	-.001	-.001	-.026	
38.35	-.043	-.014	0	-.004	-.001	-.001	-.026	
39.24	-.054	-.020	0	-.004	-.002	-.001	-.025	
40.85	-.043	-.015	0	-.005	0	-.008	-.027	
42.85	-.049	-.019	0	-.005	0	-.002	-.011	
43.85	-.049	-.018	0	-.004	0	-.002	-.011	
44.85	-.051	-.019	0	-.006	0	-.002	-.011	
45.85	-.055	-.023	0	-.009	0	-.006	-.007	
47.85	-.067	-.023	0	-.020	0	-.017	-.028	
49.85	-.135	-.099	0	-.083	0	-.074	-.099	

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(11) $M = 0.60$; $\alpha = -10^\circ$ to 10° ; $\phi = 90^\circ$

x, in.		Upright						Inverted					
		C_p for -			C_p for -			C_p for -			C_p for -		
$\alpha = -10^\circ$	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	$\alpha = 10^\circ$	$\alpha = -10^\circ$	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	$\alpha = 10^\circ$
11.51	0.068	0.0001	-0.016	-0.041	-0.068	-0.101	-0.083	.162	.169	.177	-0.079	-0.097	-0.062
12.01	.087	.111	.124	.141	.157	.162	.12.01	.177	.182	.175	.170	.157	.138
12.51	.244	.218	.216	.225	.233	.251	.288	.263	.251	.217	.193	.186	.183
13.21	.017	.004	.004	.005	.001	.017	.018	.13.51	.050	.011	.001	.008	.004
14.51	.024	.006	.006	.005	.005	.016	.050	.14.51	.051	.010	.001	.002	.002
15.51	.030	.002	.002	.001	.007	.008	.012	.15.51	.046	.010	.002	.002	.001
17.01	.032	---	---	.004	.009	.010	.011	.17.01	.038	.009	.003	.005	.004
19.01	.033	.002	.002	.008	.013	.014	.008	.028	.19.01	.030	.006	.007	.009
21.01	.020	.021	.021	.022	.029	.028	.015	.21.01	.019	.011	.024	.027	.015
23.01	.131	.171	.165	.175	.174	.174	.135	.23.01	.134	.156	.168	.164	.160
24.09	.014	.028	.048	.053	.052	.029	.011	.24.09	.017	.011	.014	.050	.043
25.59	.061	.019	.004	.009	.009	.015	.060	.25.59	.061	.014	.001	.003	.014
27.59	.122	.082	.061	.058	.058	.059	.133	.27.59	.121	.078	.061	.057	.084
28.39	.247	.198	.160	.164	.208	.266	.266	.28.39	.252	.204	.172	.160	.202
29.35	.122	.074	.056	.051	.053	.075	.124	.29.35	.122	.072	.058	.061	.075
30.35	.095	.050	.029	.026	.026	.046	.046	.30.35	.094	.047	.033	.035	.093
31.35	.086	.038	.019	.017	.017	.057	.057	.31.35	.086	.058	.023	.019	.082
32.85	.078	.029	.011	.009	.009	.030	.030	.32.85	.077	.028	.014	.010	.075
34.85	.074	.026	.004	.004	.004	.026	.026	.34.85	.074	.025	.010	.012	.070
36.85	.069	.021	---	0	.003	.021	.021	.36.85	.068	.018	.004	.001	.022
38.85	.066	.018	0	.004	.003	.017	.017	.38.85	.068	.021	.002	.006	.064
39.24	.074	.024	.001	.002	.001	.018	.018	.39.24	.073	.023	.003	.001	.021
40.85	.060	.016	.004	.005	.005	.015	.015	.40.85	.062	.015	.001	.002	.058
42.85	.064	.021	.002	.001	.001	.020	.020	.42.85	.067	.022	.006	.008	.023
44.85	.066	.025	.006	.004	.004	.024	.024	.44.85	.069	.025	.010	.004	.027

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(i) $M = 0.80$; $\alpha = -6^\circ$ to 6° ; $\phi = 0^\circ$

		Upright							Inverted				
		x, in.	C_p for -					x, in.	C_p for -				
Conical fairing	Upper stage		$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$		$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$
Upper stage	Conical fairing	11.51	-0.376	-0.371	-0.352	-0.335	-0.330	11.51	0.093	0.074	0.056	0.057	0.061
	Transition flare	12.01	-.330	-.335	-.323	-.307	-.304	12.01	.057	.041	.026	.029	.033
	Upper stage	12.51	-.220	-.214	-.206	-.204	-.210	12.51	-.489	-.472	-.461	-.442	-.438
	Conical fairing	13.01	-.069	-.083	-.087	-.090	-.088	13.01	-.043	-.043	-.042	-.040	-.046
	Transition flare	13.51	.036	.021	.021	.024	.031	13.51	-.010	-.010	-.010	-.009	-.014
	Upper stage	14.01	.058	.049	.057	.068	.080	14.01	-.003	-.005	-.004	-.004	-.010
	Conical fairing	14.51	.049	.043	.054	.065	.071	14.51	.004	0	-----	-----	.007
	Transition flare	15.01	.037	.031	.039	.048	.053	15.01	.007	.002	.002	.001	.007
	Upper stage	15.51	.032	.026	.030	.035	.039	15.51	.014	.008	.007	.006	.002
	Conical fairing	16.01	.025	.021	.020	.024	.024	16.01	.012	.005	.004	.002	.007
	Transition flare	17.01	.021	.013	.014	.015	.014	17.01	.016	.008	.006	.005	.003
	Upper stage	18.01	.024	.014	.014	.015	.010	18.01	.020	.012	.009	.008	-----
	Conical fairing	19.01	.031	.021	.020	.020	.014	19.01	.028	.019	.015	.015	.006
	Transition flare	21.01	.049	.038	.036	.034	.027	21.01	.046	.036	.033	.031	.021
	Upper stage	23.01	.247	.215	.212	.204	.203	23.01	.294	.251	.215	.205	.206
Main stage	Conical fairing	24.09	.111	.083	.070	.055	.043	24.09	.117	.090	.072	.064	.049
	Transition flare	24.59	.086	.058	.043	.026	.015	24.59	.086	.061	.042	.034	.020
	Upper stage	25.59	.060	.031	.016	-.001	-.013	25.59	.061	.035	.014	.005	-.008
	Conical fairing	26.59	.033	.003	-.013	-.029	-.041	26.59	.033	.008	-.013	-.023	-.034
	Transition flare	27.59	-.022	-.050	-.064	-.078	-.089	27.59	-.021	-.049	-.070	-.075	-.083
	Upper stage	28.09	-.118	-.135	-.147	-.158	-.171	28.09	-.135	-.156	-.168	-.170	-.181
	Conical fairing	28.39	-.196	-.192	-.195	-.185	-.190	28.39	-.230	-.235	-.219	-.195	-.210
	Transition flare	28.85	-.077	-.089	-.091	-.093	-.100	28.85	-.083	-.094	-.101	-.098	-.104
	Upper stage	29.35	-.044	-.057	-.059	-.062	-.067	29.35	-.046	-.057	-.065	-.062	-.069
	Conical fairing	29.85	-.026	-.038	-.040	-.043	-.049	29.85	-.027	-.039	-.045	-.044	-.052
	Transition flare	30.35	-.016	-.029	-.030	-.034	-.037	30.35	-.017	-.029	-.035	-.034	-.040
	Upper stage	30.85	-.010	-.022	-.023	-.027	-.032	30.85	-.011	-.022	-.027	-.026	-.033
	Conical fairing	31.35	-.006	-.018	-.020	-.023	-.029	31.35	-.008	-.019	-.024	-.023	-.029
	Transition flare	31.85	-.001	-.013	-.014	-.018	-.023	31.85	-.003	-.014	-.019	-.018	-.025
	Upper stage	32.85	.007	-.006	-.007	-.012	-.016	32.85	.004	-.007	-.012	-.011	-.015
	Conical fairing	33.85	.008	-.004	-.005	-.010	-.014	33.85	.005	-.006	-.010	-.009	-.013
	Transition flare	34.85	.011	-.002	-.002	-.007	-.012	34.85	.009	-.002	-.008	-.006	-.009
	Upper stage	36.85	.012	0	-.001	-.005	-.011	36.85	.009	-.002	-.005	-.004	-.007
	Conical fairing	38.85	.017	.004	.003	-.001	-.007	38.85	.014	.003	-.002	-----	.004
	Transition flare	39.24	.017	.002	.001	.001	.001	39.24	.015	.004	-----	.006	.006
	Upper stage	40.85	.020	.006	.004	-----	-.005	40.85	.017	.005	-----	0	-.002
	Conical fairing	42.85	.015	.001	-----	-.004	-.010	42.85	.011	.001	-.004	-.003	-.006
	Transition flare	43.85	.016	.002	.001	-.004	-.008	43.85	.014	.003	-.003	-.003	-.005
	Upper stage	44.85	.012	-.002	-.002	-.008	-.013	44.85	.009	-.002	-.007	-.006	-.010

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TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(j) $M = 0.80$; $\alpha = -6^\circ$ to 6° ; $\phi = 30^\circ$

Upright							Inverted						
x, in.	C _p for -					Conical fairing	Upper stage	C _p for -					
	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$			$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	
Conical fairing													
12.51	-0.207	-0.229	-0.240	-0.241	-0.241			12.51	-0.397	-0.371	-0.352	-0.334	-0.340
13.01	.042	.015	-.005	-.025	-.032			13.01	-.033	-.023	-.017	-.015	-.022
13.51	.098	.089	.085	.070	.049			13.51	-.018	-.010	-.005	-.003	-.010
14.01	.080	.080	.081	.070	.054			14.01	-.009	-.003	.001	.002	-.007
14.51	.056	.056	.059	.046	.037			14.51	-.005	-.002	.001	.002	-.008
15.01	.039	.039	.042	.032	.025			15.01	0	.002	.004	.004	-.007
15.51	.032	.029	.032	.024	.016			15.51	.005	.006	.006	.006	-.004
16.01	.024	.022	.023	.015	.006			16.01	.003	.003	.004	.004	-.008
17.01	.021	.016	.016	.010	.002			17.01	.008	.006	.006	.006	-.006
18.01	.025	.020	.020	.013	.005			18.01	.015	.012	.013	.011	-----
19.01	.027	.020	.020	.012	.005			19.01	.017	.014	.014	.012	.001
21.01	.045	.039	.041	.031	.023			21.01	.039	.036	.035	.033	.023
23.01	.241	.222	.217	.187	.168			23.01	.264	.228	.207	.208	.192
Transition flare								Transition flare					
24.09	.102	.080	.071	.053	.038			24.09	.099	.081	.070	.061	.043
24.59	.076	.054	.042	.025	.011			24.59	.071	.054	.041	.031	.013
25.59	.048	.028	.016	-.002	-.017			25.59	.046	.026	.012	.005	-.014
26.59	.024	.002	-.011	-.029	-.043			26.59	.021	.001	-.015	-.022	-.040
27.59	-.031	-.051	-.062	-.079	-.090			27.59	-.035	-.053	-.068	-.072	-.089
28.09	-.126	-.137	-.145	-.157	-.167			28.09	-.140	-.152	-.159	-.161	-.174
Main stage								Main stage					
28.39	-.207	-.203	-.204	-.190	-.196			28.39	-.230	-.228	-.211	-.201	-.202
28.85	-.087	-.093	-.092	-.096	-.104			28.85	-.092	-.097	-.099	-.097	-.102
29.35	-.056	-.061	-.060	-.065	-.071			29.35	-.059	-.063	-.064	-.065	-.069
29.85	-.039	-.044	-.043	-.047	-.054			29.85	-.041	-.045	-.046	-.047	-.052
30.35	-.027	-.032	-.031	-.035	-.043			30.35	-.029	-.032	-.034	-.033	-.039
30.85	-.022	-.027	-.026	-.029	-.035			30.85	-.025	-.027	-.026	-.028	-.033
31.35	-.019	-.023	-.022	-.025	-.032			31.35	-.021	-.023	-.024	-.025	-.029
31.85	-.013	-.018	-.016	-.021	-.027			31.85	-.016	-.017	-.019	-.020	-.023
32.85	-.004	-.010	-.009	-.014	-.019			32.85	-.007	-.011	-.012	-.012	-.016
33.85	-.004	-.008	-.007	-.012	-.019			33.85	-.007	-.008	-.010	-.010	-.014
34.85	-----	-.005	-.003	-.008	-.014			34.85	-.004	-.005	-.006	-.007	-.009
36.85	.004	0	0	-.004	-.010			36.85	.001	-----	-.003	-.003	-.006
38.85	.011	.005	.006	-----	-.002			38.85	.009	.006	.003	.003	-----
39.24	.002	-.001	.001	-.001	-----			39.24	.001	0	-.001	.007	.003
40.85	.008	.002	.003	-----	-.007			40.85	.005	.002	-----	-----	-.004
42.85	.002	-.003	-.002	-.005	-.012			42.85	-.001	-.004	-.007	-.007	-.009
43.85	.002	-.004	-.002	-.006	-.013			43.85	-.001	-.005	-.007	-.007	-.010
44.85	.001	-.005	-.004	-.008	-.015			44.85	-.004	-.007	-.009	-.010	-.012
45.85	.002	-.005	-.004	-.009	-.015			45.85	-.002	-.007	-.008	-.008	-.012
47.85	-.013	-.018	-.017	-.023	-.030			47.85	-.016	-.018	-.021	-.022	-.027
49.85	-.079	-.082	-.079	-.088	-.102			49.85	-.082	-.078	-.081	-.088	-.100

~~CONFIDENTIAL~~

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(k) $M = 0.80$; $\alpha = -6^\circ$ to 6° ; $\phi = 60^\circ$

Upright							Inverted						
x, in.	C_p for -					Conical fairing	Upper stage	C_p for -					
	$\alpha=-6^\circ$	$\alpha=-3^\circ$	$\alpha=0^\circ$	$\alpha=3^\circ$	$\alpha=6^\circ$			$\alpha=-6^\circ$	$\alpha=-3^\circ$	$\alpha=0^\circ$	$\alpha=3^\circ$	$\alpha=6^\circ$	
Conical fairing	12.51	-0.117	-0.195	-0.243	-0.300	-0.353		12.51	-0.121	-0.073	-0.050	-0.063	-0.106
	13.01	.064	.038	.013	-.022	-.056		13.01	-.037	-.019	-.015	-.024	-.043
	13.51	.056	.044	.033	.007	-.016		13.51	-.033	-.018	-.017	-.023	-.038
	14.01	.037	.036	.032	.015	-.004		14.01	-.025	-.013	-.013	-.018	-.031
	14.51	.026	.029	.027	.015	-----		14.51	-.020	-.007	-.009	-.014	-.027
	15.01	.016	.021	.023	.011	-.001		15.01	-.016	-.005	-.005	-.011	-.023
	15.51	.013	.019	.021	.012	-.001		15.51	-.010	-----	-.001	-.005	-.018
	16.01	.006	.013	.016	.005	-.006		16.01	-.012	-.003	-.002	-.008	-.019
	17.01	.004	.013	.015	.006	-.002		17.01	-.008	.001	.003	-.002	-.010
	18.01	.006	.014	.017	.008	-.001		18.01	-.003	.006	.008	.002	-.003
Upper stage	19.01	.009	.018	.021	.014	.003		19.01	.001	.011	.013	.008	.003
	21.01	.028	.034	.038	.030	.020		21.01	.020	.029	.032	.027	.023
	23.01	.219	.220	.200	.196	.188		23.01	.220	.208	.217	.199	.159
	24.09	.069	.068	.064	.054	.036		24.09	.062	.066	.065	.048	.037
	24.59	.045	.044	.042	.031	.011		24.59	.038	.042	.041	.026	.013
	25.59	.020	.019	.015	.004	-.016		25.59	.014	.016	.014	-----	-.015
	26.59	-.010	-.010	-.014	-.026	-.046		26.59	-.015	-.015	-.015	-.030	-.044
	27.59	-.068	-.067	-.070	-.080	-.100		27.59	-.073	-.071	-.072	-.084	-.098
	28.09	-.148	-.145	-.143	-.149	-.165		28.09	-.159	-.151	-.145	-.154	-.160
	28.39	-.260	-.246	-.224	-.218	-.205		28.35	-.281	-.249	-.238	-.212	-.200
Transition flare	28.85	-.104	-.096	-.091	-.093	-.103		28.85	-.109	-.099	-.095	-.094	-.099
	29.35	-.074	-.067	-.061	-.065	-.073		29.35	-.079	-.069	-.067	-.067	-.070
	29.85	-.055	-.047	-.042	-.046	-.055		29.85	-.059	-.049	-.048	-.047	-.052
	30.35	-.045	-.035	-.031	-.035	-.043		30.35	-.049	-.037	-.037	-.036	-.040
	30.85	-.040	-.030	-.025	-.029	-.037		30.85	-.044	-.033	-.029	-.031	-.035
	31.35	-.034	-.025	-.021	-.023	-.032		31.35	-.040	-.029	-.025	-.026	-.031
	31.85	-.026	-.017	-.012	-.017	-.024		31.85	-.032	-.021	-.017	-.018	-.022
	32.85	-.021	-.014	-.008	-.013	-.021		32.85	-.026	-.016	-.012	-.015	-.019
	33.85	-.020	-.011	-.007	-.011	-.019		33.85	-.026	-.015	-.011	-.013	-.018
	34.85	-.008	-.003	-.002	-.007	-.015		34.85	-.014	-.008	-.005	-.008	-.014
Main stage	36.85	-.012	-.003	.001	-.003	-.012		36.85	-.018	-.007	-.002	-.005	-.011
	38.85	-.008	.001	.004	-.001	-.010		38.85	-.016	-.004	0	-.002	-.008
	39.24	-.017	-.007	-----	-.002	-.009		39.24	-.021	-.010	-.003	-.003	-.009
	40.85	-.008	-----	.004	-.002	-.011		40.85	-.015	-.005	0	-.003	-.013
	42.85	-.014	-.006	-.001	-.005	-.015		42.85	-.020	-.009	-.005	-.007	-.014
	43.85	-.013	-.005	-----	-.006	-.014		43.85	-.019	-.009	-.005	-.007	-.016
	44.85	-.014	-.006	-.003	-.007	-.016		44.85	-.021	-.010	-.007	-.007	-.016
	45.85	-.019	-.010	-.007	-.010	-.019		45.85	-.026	-.015	-.011	-.011	-.019
	47.85	-.028	-.020	-.017	-.021	-.032		47.85	-.035	-.024	-.021	-.023	-.032
	49.85	-.100	-.090	-.080	-.086	-.105		49.85	-.106	-.089	-.082	-.092	-.105

TABLE III.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued.

(1) $M = 0.80$; $\alpha = -6^\circ$ to 6° ; $\phi = 90^\circ$

x, in.	C _p for -				C _p for -			
	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$
11.51	-0.179	-0.200	-0.212	-0.219	-0.238	11.51	-0.251	-0.238
12.01	.090	.098	.116	.138	.164	12.01	.118	.098
12.51	-.251	-.236	-.229	-.249	-.289	12.51	-.195	-.188
13.51	.017	.015	.013	.001	-.014	13.51	-.010	-.001
14.51	.010	.008	.014	.004	-.007	14.51	-.007	-.001
15.51	.006	.008	.011	.007	-.008	15.51	-.007	.001
17.01	.005	.009	.014	.006	-.008	17.01	-.007	.002
19.01	.007	.012	.018	.009	-.005	19.01	-.003	.003
21.01	.020	.035	.037	.024	.015	21.01	.017	.008
23.01	.196	.192	.197	.186	.166	23.01	.176	.181
24.09	.044	.053	.062	.055	.038	24.09	.037	.055
25.59	-.007	.006	.013	.007	-.013	25.59	-.013	.005
27.59	-.084	-.072	-.067	-.076	-.098	27.59	-.089	-.071
28.39	-.243	-.224	-.196	-.204	-.260	28.39	-.260	-.218
29.35	-.079	-.067	-.063	-.067	-.086	29.35	-.086	-.072
30.35	-.049	-.035	-.031	-.035	-.054	30.35	-.054	-.041
31.35	-.035	-.023	-.018	-.022	-.043	31.35	-.043	-.028
32.85	-.025	-.013	-.011	-.013	-.033	32.85	-.034	-.019
34.85	-.022	-.009	-.005	-.010	-.028	34.85	-.029	-.015
36.85	-.016	-.003	-.003	-.005	-.024	36.85	-.024	-.009
38.85	-.015	-.002	-.001	-.001	-.021	38.85	-.023	-.008
39.24	-.019	-.005	-.001	-.001	-.020	39.24	-.026	-.011
40.85	-.009	-.002	-.002	-.002	-.017	40.85	-.018	-.003
42.85	-.017	-.004	-.002	-.005	-.025	42.85	-.024	-.010
44.85	-.019	-.008	-.004	-.007	-.028	44.85	-.027	-.014

x, in.	C _p for -				C _p for -			
	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$
11.51	11.51	12.01	12.51	13.51	14.51	15.51	17.01	19.01
12.01	12.01	12.51	13.51	14.51	15.51	17.01	19.01	21.01
12.51	12.51	13.51	14.51	15.51	17.01	19.01	21.01	23.01
13.51	13.51	14.51	15.51	17.01	19.01	21.01	23.01	25.09
14.51	14.51	15.51	17.01	19.01	21.01	23.01	25.09	27.59
15.51	15.51	17.01	19.01	21.01	23.01	25.09	27.59	29.35
17.01	17.01	19.01	21.01	23.01	25.09	27.59	29.35	31.35
19.01	19.01	21.01	23.01	25.09	27.59	29.35	31.35	32.85
21.01	21.01	23.01	25.09	27.59	29.35	31.35	32.85	34.85
23.01	23.01	25.09	27.59	29.35	31.35	32.85	34.85	36.85
24.09	24.09	25.59	27.59	29.35	31.35	32.85	34.85	36.85
25.59	25.59	27.59	29.35	31.35	32.85	34.85	36.85	38.85
27.59	27.59	29.35	31.35	32.85	34.85	36.85	38.85	39.24
28.39	28.39	29.35	30.35	31.35	32.85	34.85	36.85	38.85
29.35	29.35	30.35	31.35	32.85	34.85	36.85	38.85	39.24
30.35	30.35	31.35	32.85	34.85	36.85	38.85	39.24	39.24
31.35	31.35	32.85	34.85	36.85	38.85	39.24	39.24	39.24
32.85	32.85	34.85	36.85	38.85	39.24	39.24	39.24	39.24
34.85	34.85	36.85	38.85	39.24	39.24	39.24	39.24	39.24
36.85	36.85	38.85	39.24	39.24	39.24	39.24	39.24	39.24
38.85	38.85	39.24	39.24	39.24	39.24	39.24	39.24	39.24
39.24	39.24	39.24	39.24	39.24	39.24	39.24	39.24	39.24
40.85	40.85	40.85	40.85	40.85	40.85	40.85	40.85	40.85
42.85	42.85	42.85	42.85	42.85	42.85	42.85	42.85	42.85
44.85	44.85	44.85	44.85	44.85	44.85	44.85	44.85	44.85

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(m) $M = 1.0; \alpha = -6^\circ$ to $6^\circ; \phi = 0^\circ$

		Upright					Inverted							
		x , in.	C_p for -					x , in.	C_p for -					
Conical fairing	Upper stage		$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$		Conical fairing	Upper stage	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$
Conical fairing	Upper stage	11.51	-0.583	-0.559	-0.534	-0.522	-0.509	11.51	-0.039	-0.068	-0.108	-0.132	-0.150	
		12.01	-.555	-.534	-.513	-.500	-.489	12.01	-.122	-.143	-.140	-.154	-.159	
		12.51	-.434	-.421	-.414	-.407	-.395	12.51	-.414	-.432	-.456	-.436	-.439	
		13.01	-.302	-.324	-.325	-.314	-.303	13.01	-.366	-.372	-.388	-.390	-.411	
		13.51	-.170	-.201	-.217	-.210	-.197	13.51	-.152	-.129	-.131	-.154	-.203	
		14.01	-.101	-.112	-.119	-.107	-.093	14.01	-.123	-.111	-.098	-.097	-.093	
		14.51	-.072	-.070	-.067	-.048	-.031	14.51	-.122	-.111	-.094	-.090	-.089	
		15.01	-.063	-.056	-.046	-.027	-.011	15.01	-.110	-.095	-.079	-.078	-.088	
		15.51	-.053	-.047	-.038	-.021	-.010	15.51	-.088	-.074	-.062	-.063	-.075	
		16.01	-.051	-.049	-.041	-.029	-.022	16.01	-.072	-.064	-.056	-.060	-.074	
		17.01	-.045	-.045	-.043	-.036	-.035	17.01	-.048	-.048	-.047	-.054	-.068	
Transition flare	Upper stage	18.01	-.037	-.041	-.040	-.036	-.033	18.01	-.037	-.041	-.043	-.049	-.064	
		19.01	-.021	-.029	-.027	-.018	-.001	19.01	-.026	-.033	-.035	-.032	-.045	
		21.01	.075	.063	.066	.072	.074	21.01	.071	.063	.060	.066	.054	
		23.01	.329	.273	.264	.269	.275	23.01	.374	.331	.294	.290	.299	
		24.09	.184	.153	.137	.129	.118	24.09	.194	.167	.152	.141	.123	
		24.59	.155	.126	.109	.099	.086	24.59	.160	.135	.119	.107	.087	
		25.59	.128	.098	.079	.068	.053	25.59	.133	.106	.089	.075	.056	
		26.59	.106	.072	.052	.039	.023	26.59	.111	.083	.064	.049	.029	
		27.59	.063	.020	-.004	-.020	-.032	27.59	.075	.045	.021	.004	-.016	
		28.09	-.040	-.091	-.119	-.136	-.143	28.09	-.024	-.055	-.084	-.097	-.107	
Main stage	Main stage	28.39	-.270	-.281	-.305	-.321	-.341	28.39	-.263	-.283	-.280	-.296	-.326	
		28.85	-.210	-.198	-.211	-.218	-.280	28.85	-.216	-.244	-.253	-.291	-.336	
		29.35	-.168	-.175	-.163	-.157	-.171	29.35	-.176	-.206	-.216	-.228	-.257	
		29.85	-.138	-.141	-.130	-.127	-.128	29.85	-.145	-.160	-.150	-.136	-.111	
		30.35	-.115	-.109	-.109	-.107	-.113	30.35	-.124	-.114	-.110	-.102	-.103	
		30.85	-.089	-.087	-.090	-.088	-.093	30.85	-.088	-.087	-.084	-.084	-.101	
		31.35	-.068	-.071	-.074	-.073	-.079	31.35	-.065	-.068	-.065	-.068	-.071	
		31.85	-.050	-.058	-.061	-.060	-.066	31.85	-.048	-.053	-.051	-.056	-.062	
		32.85	-.027	-.035	-.040	-.040	-.048	32.85	-.025	-.031	-.030	-.036	-.043	
		33.85	-.022	-.027	-.032	-.033	-.041	33.85	-.022	-.028	-.027	-.030	-.030	
		34.85	-.012	-.021	-.026	-.027	-.034	34.85	-.012	-.020	-.020	-.024	-.028	
		36.85	-.008	-.019	-.022	-.021	-.021	36.85	-.015	-.023	-.023	-.014	-.016	
Main stage	Transition flare	38.85	.032	.014	.010	.011	.007	38.85	.002	-.001	.001	.017	.010	
		39.24	.032	.019	.017	.022	.021	39.24	.017	.012	.017	.030	.026	
		40.85	.036	.025	.022	.021	.015	40.85	.042	.031	.024	.019	.015	
		42.85	.023	.016	.012	.012	.005	42.85	.031	.021	.015	.008	.003	
		43.85	.023	.013	.010	.010	.003	43.85	.030	.019	.013	.007	.001	
		44.85	.016	.008	.005	.005	-.002	44.85	.022	.012	.007	.002	-.004	

TABLE II.-- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(n) $M = 1.00$; $\alpha = -6^\circ$ to 6° ; $\phi = 30^\circ$

		Upright							Inverted						
		C_p for -							C_p for -						
		x , in.	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$			x , in.	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$
Conical fairing	Upper stage	12.51	-0.413	-0.441	-0.458	-0.461	-0.454	Conical fairing	Upper stage	12.51	-0.383	-0.393	-0.403	-0.394	-0.390
		13.01	-.181	-.227	-.262	-.265	-.253			13.01	-.287	-.267	-.278	-.282	-.336
		13.51	-.105	-.110	-.128	-.142	-.163			13.51	-.192	-.164	-.153	-.170	-.209
		14.01	-.068	-.059	-.062	-.076	-.096			14.01	-.137	-.116	-.098	-.096	-.097
		14.51	-.069	-.052	-.045	-.053	-.066			14.51	-.134	-.113	-.093	-.089	-.096
		15.01	-.065	-.046	-.036	-.039	-.047			15.01	-.114	-.093	-.075	-.074	-.087
		15.51	-.061	-.044	-.032	-.034	-.042			15.51	-.093	-.073	-.059	-.060	-.076
		16.01	-.059	-.049	-.039	-.040	-.046			16.01	-.080	-.065	-.055	-.060	-.077
		17.01	-.050	-.046	-.042	-.043	-.049			17.01	-.056	-.050	-.046	-.054	-.072
		18.01	-.038	-.038	-.035	-.035	-.039			18.01	-.040	-.039	-.038	-.044	-.062
Transition flare	Main stage	19.01	-.030	-.034	-.029	-.024	-.014	Transition flare	Main stage	19.01	-.038	-.038	-.038	-.036	-.051
		21.01	.072	.066	.069	.072	.068			21.01	.068	.064	.062	.067	.052
		23.01	.322	.289	.275	.254	.243			23.01	.346	.306	.288	.292	.273
		24.09	.173	.154	.138	.127	.113			24.09	.177	.158	.148	.137	.111
		24.59	.143	.125	.111	.097	.084			24.59	.143	.127	.117	.002	.078
		25.59	.115	.096	.081	.068	.051			25.59	.118	.098	.087	.073	.047
		26.59	.094	.072	.056	.040	.023			26.59	.098	.078	.065	.048	.021
		27.59	.053	.023	.001	-.016	-.029			27.59	.061	.038	.020	.003	-.027
		28.09	-.040	-.076	-.100	-.121	-.128			28.09	-.029	-.053	-.077	-.087	-.119
		28.39	-.284	-.300	-.326	-.319	-.343			28.39	-.279	-.291	-.288	-.318	-.351
Upper stage	Transition flare	28.85	-.233	-.225	-.228	-.242	-.277	Main stage	Transition flare	28.85	-.234	-.255	-.262	-.302	-.293
		29.35	-.186	-.182	-.165	-.164	-.190			29.35	-.189	-.205	-.201	-.187	-.203
		29.85	-.161	-.146	-.135	-.133	-.141			29.85	-.166	-.162	-.157	-.149	-.134
		30.35	-.129	-.114	-.111	-.111	-.120			30.35	-.131	-.122	-.114	-.113	-.111
		30.85	-.101	-.093	-.093	-.091	-.100			30.85	-.100	-.094	-.087	-.094	-.095
		31.35	-.082	-.078	-.079	-.078	-.086			31.35	-.080	-.075	-.072	-.078	-.077
		31.85	-.065	-.062	-.063	-.063	-.072			31.85	-.062	-.058	-.055	-.062	-.065
		32.85	-.039	-.039	-.041	-.043	-.052			32.85	-.037	-.035	-.035	-.040	-.042
		33.85	-.035	-.031	-.033	-.035	-.043			33.85	-.034	-.033	-.029	-.033	-.035
		34.85	-.024	-.025	-.027	-.030	-.037			34.85	-.025	-.025	-.023	-.028	-.027
Main stage	Main stage	36.85	-.017	-.020	-.018	-.020	-.020	Main stage	Main stage	36.85	-.024	-.024	-.021	-.014	-.014
		38.85	.027	.015	.014	.015	.008			38.85	-.001	.002	.003	.019	.013
		39.24	.018	.015	.016	.021	.016			39.24	.005	.008	.018	.029	.019
		40.85	.026	.023	.021	.018	.014			40.85	.029	.027	.025	.018	.011
		42.85	.011	.011	.010	.009	.004			42.85	.017	.015	.014	.005	.000
		43.85	.008	.008	.007	.006	0			43.85	.013	.012	.010	.002	-.003
		44.85	.004	.004	.003	.001	-.004			44.85	.008	.007	.005	-.002	-.007
		45.85	.006	.003	.002	.001	-.004			45.85	.009	.006	.004	-.001	-.008
		47.85	-.002	-.007	-.010	-.013	-.019			47.85	-.003	-.004	-.007	-.012	-.020
		49.85	-.065	-.101	-.120	-.130	-.141			49.85	-.065	-.085	-.109	-.115	-.140

TABLE II.-- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(o) $M = 1.00$; $\alpha = -6^\circ$ to 6° ; $\phi = 60^\circ$

		Upright							Inverted					
		x, in.	C_p for -					x, in.	C_p for -					
Conical fairing	Upper stage		$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$		Conical fairing	Upper stage				
		12.51	-0.391	-0.398	-0.404	-0.409	-0.420		12.51	-0.297	-0.270	-0.300	-0.242	-0.250
		13.01	-.321	-.315	-.311	-.324	-.388		13.01	-.208	-.194	-.199	-.123	-.274
		13.51	-.122	-.108	-.123	-.156	-.192		13.51	-.217	-.184	-.174	-.196	-.215
		14.01	-.097	-.089	-.098	-.121	-.150		14.01	-.175	-.141	-.128	-.145	-.155
		14.51	-.096	-.079	-.081	-.091	-.114		14.51	-.150	-.117	-.103	-.118	-.129
		15.01	-.085	-.065	-.063	-.069	-.085		15.01	-.123	-.093	-.081	-.096	-.110
		15.51	-.073	-.054	-.051	-.057	-.068		15.51	-.099	-.072	-.062	-.078	-.093
		16.01	-.075	-.057	-.053	-.056	-.066		16.01	-.089	-.066	-.059	-.076	-.089
		17.01	-.067	-.051	-.046	-.049	-.057		17.01	-.069	-.053	-.048	-.065	-.074
		18.01	-.059	-.045	-.041	-.043	-.049		18.01	-.060	-.046	-.043	-.058	-.063
		19.01	-.045	-.038	-.032	-.031	-.019		19.01	-.050	-.039	-.037	-.043	-.045
		21.01	.058	.061	.065	.068	.065		21.01	.053	.058	.057	.057	.055
		23.01	.290	.280	.248	.265	.272		23.01	.297	.279	.300	.276	.215
	Transition flare	24.09	.138	.139	.133	.129	.110		24.09	.139	.141	.141	.118	.105
		24.59	.109	.112	.107	.104	.083		24.59	.112	.115	.114	.091	.079
		25.59	.084	.086	.080	.074	.053		25.59	.085	.088	.086	.063	.049
		26.59	.058	.059	.051	.044	.023		26.59	.062	.062	.060	.035	.020
		27.59	.010	.006	-.006	-.014	-.034		27.59	.015	.012	.009	-.020	-.037
		28.09	-.068	-.077	-.101	-.109	-.131		28.09	-.059	-.069	-.074	-.112	-.138
		28.39	-.334	-.335	-.338	-.347	-.335		28.39	-.328	-.325	-.327	-.358	-.321
		28.85	-.265	-.252	-.232	-.233	-.256		28.85	-.272	-.260	-.243	-.222	-.249
		29.35	-.221	-.185	-.174	-.185	-.202		29.35	-.228	-.196	-.176	-.185	-.195
		29.85	-.177	-.141	-.138	-.141	-.150		29.85	-.173	-.156	-.151	-.150	-.150
		30.35	-.139	-.117	-.112	-.113	-.118		30.35	-.157	-.124	-.117	-.119	-.117
		30.85	-.115	-.099	-.094	-.094	-.101		30.85	-.117	-.098	-.092	-.097	-.099
		31.35	-.099	-.084	-.077	-.078	-.084		31.35	-.101	-.080	-.074	-.078	-.082
		31.85	-.079	-.061	-.057	-.059	-.067		31.85	-.078	-.059	-.053	-.059	-.065
		32.85	-.057	-.042	-.041	-.043	-.054		32.85	-.058	-.042	-.034	-.043	-.048
		33.85	-.053	-.055	-.034	-.036	-.046		33.85	-.055	-.038	-.028	-.034	-.040
		34.85	-.032	-.023	-.025	-.029	-.037		34.85	-.037	-.026	-.019	-.027	-.031
		36.85	-.029	-.021	-.019	-.020	-.025		36.85	-.041	-.026	-.019	-.014	-.020
		38.85	.008	.013	.011	.009	.003		38.85	.018	-.003	.002	.012	.005
		39.24	-.005	.009	.015	.015	.008		39.24	-.018	-.001	.014	.015	.008
		40.85	.008	.020	.020	.018	.008		40.85	.012	.021	.026	.014	.005
		42.85	-.007	.008	.010	.010	.001		42.85	-.001	.012	.015	.005	-.004
		43.85	-.009	.005	.007	.007	-.002		43.85	-.004	.008	.012	.002	-.007
		44.85	-.012	.001	.004	.003	-.005		44.85	-.008	.004	.008	-.001	-.010
		45.85	-.016	-.003	0	-.001	-.009		45.85	-.014	-.001	.002	-.004	-.013
		47.85	-.019	-.010	-.010	-.014	-.020		47.85	-.020	-.009	-.007	-.013	-.022
		49.85	-.097	-.111	-.124	-.129	-.144		49.85	-.097	-.102	-.107	-.134	-.148
	Main stage													

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(p) $M = 1.00; \alpha = -6^\circ$ to $6^\circ; \phi = 90^\circ$

		Upright				Inverted			
		x, in.	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$
11.51	-0.196	-0.275	-0.311	-0.352	-0.379	-0.324	-0.310	-0.307	-0.303
12.01	-0.251	-0.194	-0.126	-0.026	.056	-.008	-.070	-.150	-.187
12.51	-0.479	-0.454	-0.431	-0.391	-.374	-.356	-.382	-.430	-.462
13.51	-0.130	-0.127	-0.140	-0.167	-.208	-.213	-.180	-.143	-.131
14.51	-0.105	-0.098	-0.100	-0.110	-.132	-.139	-.119	-.104	-.095
15.51	-0.077	-0.069	-0.068	-0.069	-.087	-.090	-.075	-.070	-.067
17.01	-0.060	-0.056	-0.053	-0.054	-.066	-.067	-.054	-.053	-.053
19.01	-0.038	-0.039	-0.036	-0.032	-.033	-.033	-.050	-.040	-.035
21.01	.059	.059	.052	.060	-.057	-.052	-.059	-.053	-.063
23.01	.256	.255	.249	.252	.233	.235	.262	.264	.235
24.09	.114	.125	.132	.131	-.114	-.114	-.132	-.129	-.124
25.59	.056	.072	.079	.076	-.059	-.060	-.077	.076	.071
27.59	-.013	-.002	-.001	-.004	-.017	-.010	.001	.001	-.010
28.39	-.360	-.352	-.336	-.346	-.386	-.363	-.352	-.370	-.365
29.35	-.230	-.186	-.191	-.197	-.226	-.220	-.194	-.187	-.178
30.35	-.134	-.118	-.115	-.117	-.134	-.136	-.119	-.115	-.120
31.35	-.095	-.076	-.074	-.076	-.097	-.098	-.076	-.072	-.079
32.85	-.060	-.041	-.041	-.045	-.067	-.066	-.044	-.046	-.062
34.85	-.045	-.028	-.028	-.031	-.052	-.053	-.031	-.027	-.031
36.85	-.026	-.020	-.019	-.022	-.039	-.045	-.026	-.022	-.018
38.85	0	.010	.010	.005	-.007	-.020	-.008	-.004	.010
39.24	-.006	.012	.017	.015	.001	.017	.002	.006	.013
40.85	.005	.020	.021	.011	.005	.006	.020	.023	.015
42.85	-.008	.008	.011	.008	-.008	-.007	.012	.003	.013
44.85	-.016	0	.003	.002	-.016	-.015	0	.004	-.005

~~CONFIDENTIAL~~

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(q) $M = 1.20$; $\alpha = -6^\circ$ to 6° ; $\phi = 0^\circ$

		Upright							Inverted				
		x, in.	C_p for -					x, in.	C_p for -				
Conical fairing	Upper stage		$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$		$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$
		11.51	-0.361	-0.369	-0.370	-0.379	-0.379	11.51	0.109	0.073	0.029	-0.030	-0.074
		12.01	-.312	-.316	-.322	-.334	-.343	12.01	.045	.010	-.024	-.072	-.093
		12.51	-.246	-.233	-.229	-.249	-.246	12.51	-.227	-.256	-.284	-.295	-.295
		13.01	-.165	-.174	-.176	-.173	-.163	13.01	-.195	-.226	-.257	-.227	-.217
		13.51	-.080	-.101	-.105	-.089	-.076	13.51	-.122	-.100	-.086	-.070	-.086
		14.01	-.040	-.048	-.046	-.024	-.008	14.01	-.043	-.035	-.031	-.042	-.071
		14.51	-.024	-.021	-.015	.006	.022	14.51	-.039	-.039	-.031	-.036	-.046
		15.01	-.014	-.011	-.002	.015	.026	15.01	-.036	-.036	-.028	-.028	-.031
		15.51	-.005	-.004	-.002	.016	.024	15.51	-.032	-.029	-.023	-.020	-.026
		16.01	-.006	-.006	-.001	.006	.015	16.01	-.028	-.028	-.021	-.019	-.022
		17.01	-.004	-.005	-.001	-.001	.009	17.01	-.018	-.017	-.010	-.016	-.013
		18.01	----	-.004	-.001	-.006	.003	18.01	-.003	-.007	-.003	-.010	-.013
		19.01	.007	.002	-.001	-.001	.002	19.01	.008	.001	-.002	-.006	-.012
		21.01	.011	-.001	-.004	.002	.002	21.01	.010	0	-.004	-.001	-.009
		23.01	.276	.225	.234	.242	.251	23.01	.295	.257	.231	.224	.231
		24.09	.173	.146	.131	.124	.114	24.09	.192	.165	.144	.140	.124
		24.59	.151	.128	.106	.094	.081	24.59	.159	.137	.115	.106	.082
		25.59	.134	.107	.090	.073	.056	25.59	.135	.112	.094	.079	.054
		26.59	.129	.093	.077	.061	.044	26.59	.131	.096	.078	.065	.043
		27.59	.121	.088	.065	.048	.034	27.59	.122	.093	.065	.053	.034
		28.09	.075	.028	.009	-.008	-.012	28.09	.086	.055	.018	.008	-.002
		28.39	-.103	-.133	-.148	-.157	-.166	28.39	-.097	-.118	-.132	-.134	-.152
		28.85	-.086	-.087	-.110	-.124	-.141	28.85	-.090	-.110	-.116	-.129	-.153
		29.35	-.063	-.072	-.087	-.100	-.123	29.35	-.066	-.091	-.102	-.130	-.138
		29.85	-.045	-.060	-.069	-.077	-.086	29.85	-.050	-.072	-.082	-.098	-.116
		30.35	-.041	-.055	-.060	-.060	-.065	30.35	-.043	-.060	-.064	-.062	-.072
		30.85	-.036	-.048	-.050	-.049	-.053	30.85	-.039	-.048	-.052	-.053	-.057
		31.35	-.035	-.041	-.045	-.046	-.049	31.35	-.040	-.039	-.047	-.050	-.051
		31.85	-.026	-.035	-.037	-.036	-.044	31.85	-.029	-.032	-.037	-.038	-.043
		32.85	-.017	-.031	-.030	-.023	-.025	32.85	-.019	-.030	-.029	-.026	-.029
		33.85	-.001	-.020	-.021	-.022	-.016	33.85	-.001	-.019	-.021	-.022	-.017
		34.85	-.005	-.011	-.009	-.006	-.012	34.85	-.007	-.014	-.008	-.006	-.008
		36.85	-.003	-.010	-.018	-.017	-.024	36.85	-.003	-.008	-.018	-.018	-.024
		38.85	.002	-.015	-.010	-.016	-.021	38.85	0	-.016	-.009	-.017	-.021
		39.24	.003	-.012	-.008	-.007	.001	39.24	.004	-.008	-.004	-.005	.001
		40.85	.007	.004	-.010	-.007	-.010	40.85	.007	.005	-.012	-.012	.012
		42.85	.019	.001	.003	.004	-.004	42.85	.018	.001	.005	.004	-.002
		43.85	.006	.008	.007	.001	-.008	43.85	.005	.006	.007	.001	-.006
		44.85	.009	.003	.001	-.004	-.014	44.85	.008	.005	.001	-.006	-.014

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(r) $M = 1.20$; $\alpha = -6^\circ$ to 6° ; $\phi = 30^\circ$

		Upright							Inverted				
x, in.		C _p for -					x, in.		C _p for -				
		$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$			$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$
Main stage	Conical fairing	Upper stage	Transition fairing	Conical fairing	Upper stage	Transition flare	Main stage	Conical fairing	Upper stage	Transition flare	Main stage	Conical fairing	
12.51	-0.234	-0.258	-0.286	-0.297	-0.300		12.51	-0.165	-0.186	-0.209	-0.204	-0.192	
13.01	.041	-.080	-.113	-.117	-.120		13.01	-.196	-.188	-.182	-.165	-.162	
13.51	-.029	-.048	-.060	-.066	-.091		13.51	-.086	-.087	-.096	-.091	-.115	
14.01	-.021	-.015	-.014	-.018	-.037		14.01	-.070	-.056	-.044	-.045	-.065	
14.51	-.013	-.004	-.005	-.009	-.025		14.51	-.058	-.045	-.032	-.033	-.047	
15.01	-.007	.001	.003	.003	-.009		15.01	-.047	-.036	-.025	-.024	-.030	
15.51	-.007	.002	.007	.005	-.006		15.51	-.041	-.031	-.021	-.018	-.025	
16.01	-.011	-.005	.001	-.002	-.008		16.01	-.039	-.030	-.021	-.018	-.025	
17.01	-.010	-.005	.002	-.006	-.007		17.01	-.025	-.019	-.009	-.014	-.017	
18.01	.002	.002	.009	0	-.001		18.01	-.004	-.003	.004	-.002	-.006	
19.01	----	-.001	----	-.005	-.010		19.01	-.003	-.005	-.002	-.008	-.015	
21.01	.006	.003	----	.002	-.003		21.01	.003	0	-.001	.002	-.004	
23.01	.275	.250	.249	.215	.201		23.01	.269	.236	.233	.249	.234	
24.09	.165	.150	.135	.123	.106		24.09	.171	.153	.143	.137	.116	
24.59	.141	.128	.108	.096	.078		24.59	.142	.128	.114	.104	.080	
25.59	.123	.107	.090	.072	.052		25.59	.120	.106	.091	.078	.052	
26.59	.118	.094	.080	.063	.044		26.59	.118	.089	.080	.066	.044	
27.59	.109	.090	.067	.045	.028		27.59	.108	.087	.065	.053	.026	
28.09	.070	.047	.025	-.003	-.011		28.09	.072	.051	.022	.016	-.010	
28.39	-.118	-.138	-.153	-.148	-.157		28.39	-.115	-.128	-.139	-.149	-.165	
28.85	-.104	-.115	-.132	-.137	-.152		28.85	-.106	-.119	-.123	-.147	-.139	
29.35	-.075	-.076	-.084	-.104	-.111		29.35	-.076	-.090	-.095	-.108	-.115	
29.85	-.064	-.068	-.071	-.079	-.096		29.85	-.064	-.077	-.078	-.084	-.099	
30.35	-.054	-.058	-.059	-.063	-.077		30.35	-.057	-.062	-.064	-.077	-.083	
30.85	-.049	-.049	-.051	-.053	-.061		30.85	-.054	-.051	-.054	-.060	-.060	
31.35	-.049	-.045	-.048	-.048	-.054		31.35	-.052	-.047	-.049	-.050	-.052	
31.85	-.037	-.037	-.038	-.039	-.046		31.85	-.038	-.038	-.039	-.040	-.043	
32.85	-.018	-.028	-.023	-.018	-.027		32.85	-.020	-.028	-.022	-.017	-.023	
33.85	-.012	-.018	-.021	-.024	-.022		33.85	-.012	-.019	-.020	-.023	-.021	
34.85	-.020	-.018	-.018	-.017	-.019		34.85	-.020	-.018	-.017	-.018	-.016	
36.85	-.015	-.011	-.016	-.015	-.026		36.85	-.015	-.010	-.015	-.018	-.023	
38.85	-.006	-.011	-.002	-.011	-.017		38.85	-.006	-.013	-.004	-.011	-.017	
39.24	-.006	-.008	-.002	-.004	-.005		39.24	-.004	-.008	-.001	0	-.006	
40.85	-.004	.001	-.010	-.009	-.016		40.85	-.005	-----	-.011	-.011	-.016	
42.85	.008	-.002	-.003	-.004	-.014		42.85	.007	-.001	-.005	-.005	-.011	
43.85	-.006	.001	.004	-.002	-.014		43.85	-.008	-----	.003	-.004	-.012	
44.85	-.003	0	.003	-.001	-.014		44.85	-.003	0	.002	-.002	-.013	
45.85	.005	.002	.002	-.003	-.008		45.85	.003	.002	0	-.002	-.006	
47.85	-.006	-.006	-.011	-.009	-.006		47.85	-.008	-.006	-.011	-.010	.007	
49.85	-.008	-.035	-.047	-.060	-.059		49.85	-.008	-.029	-.052	-.047	-.061	

TABLE II.- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Continued

(s) $M = 1.20$; $\alpha = -6^\circ$ to 6° ; $\phi = 60^\circ$

		Upright							Inverted						
		x, in.	C_p for -					Conical fairing	Upper stage	C_p for -					
x, in.	Conical fairing		$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$			$\alpha = -6^\circ$	$\alpha = -3^\circ$	$\alpha = 0^\circ$	$\alpha = 3^\circ$	$\alpha = 6^\circ$	
Upper stage	Conical fairing	12.51	-0.176	-0.203	-0.221	-0.198	-0.193			12.51	-0.137	-0.134	-0.060	0.013	-0.035
	Transition flare	13.01	.244	.223	.222	.242	.277			13.01	.078	.061	.070	.080	.119
	Upper stage	13.51	-.113	-.077	-.066	-.092	-.135			13.51	-.107	-.104	-.104	-.115	.129
	Conical fairing	14.01	-.046	-.029	-.034	-.055	-.092			14.01	-.101	-.090	-.080	-.076	.082
	Transition flare	14.51	-.032	-.024	-.028	-.037	-.063			14.51	-.085	-.061	-.050	-.052	.061
	Upper stage	15.01	-.029	-.018	-.021	-.026	-.047			15.01	-.067	-.044	-.035	-.039	.046
	Conical fairing	15.51	-.025	-.010	-.010	-.014	-.031			15.51	-.051	-.028	-.020	-.025	.033
	Transition flare	16.01	-.034	-.017	-.012	-.016	-.031			16.01	-.049	-.030	-.022	-.027	.033
	Upper stage	17.01	-.028	-.012	-.005	-.014	-.022			17.01	-.035	-.018	-.009	-.021	.021
	Conical fairing	18.01	-.021	-.008	-----	-.011	-.015			18.01	-.023	-.012	-.002	-.016	.012
Main stage	Transition flare	19.01	-.018	-.007	-.001	-.008	-.015			19.01	-.019	-.009	-.001	-.013	.012
	Upper stage	21.01	-.019	-.004	-.005	-.001	-.012			21.01	-.019	-.006	-.004	-.005	.006
	Conical fairing	23.01	.242	.241	.217	.231	.227			23.01	.240	.220	.263	.230	.182
	Transition flare	24.09	.132	.134	.130	.126	.104			24.09	.130	.133	.138	.120	.108
	Upper stage	24.59	.109	.114	.108	.103	.080			24.59	.107	.113	.113	.096	.084
	Conical fairing	25.59	.089	.097	.088	.079	.057			25.59	.089	.094	.092	.076	.059
	Transition flare	26.59	.080	.082	.080	.068	.045			26.59	.080	.078	.082	.062	.046
	Upper stage	27.59	.059	.064	.056	.046	.022			27.59	.058	.058	.057	.040	.022
	Conical fairing	28.09	.028	.031	.015	.007	-.018			28.09	.028	.027	.022	-----	-.021
	Transition flare	28.39	-.150	-.149	-.159	-.162	-.150			28.39	-.148	-.150	-.153	-.162	-.156
Main stage	Upper stage	28.85	-.123	-.118	-.112	-.123	-.128			28.85	-.124	-.116	-.120	-.119	-.120
	Conical fairing	29.35	-.110	-.102	-.098	-.100	-.112			29.35	-.113	-.101	-.087	-.096	-.110
	Transition flare	29.85	-.097	-.081	-.072	-.081	-.093			29.85	-.100	-.081	-.071	-.079	-.090
	Upper stage	30.35	-.082	-.068	-.059	-.068	-.080			30.35	-.085	-.071	-.064	-.070	-.077
	Conical fairing	30.85	-.073	-.055	-.053	-.058	-.068			30.85	-.076	-.060	-.057	-.061	-.067
	Transition flare	31.35	-.067	-.051	-.050	-.051	-.058			31.35	-.067	-.056	-.053	-.051	-.058
	Upper stage	31.85	-.048	-.036	-.035	-.034	-.042			31.85	-.050	-.040	-.034	-.037	-.042
	Conical fairing	32.85	-.024	-.015	-.010	-.015	-.029			32.85	-.025	-.016	-.010	-.017	-.027
	Transition flare	33.85	-.035	-.023	-.022	-.024	-.030			33.85	-.036	-.025	-.021	-.025	-.029
	Upper stage	34.85	-.034	-.019	-.017	-.023	-.027			34.85	-.036	-.020	-.018	-.025	-.026
Main stage	Conical fairing	36.85	-.033	-.014	-.016	-.014	-.030			36.85	-.034	-.015	-.016	-.017	-.029
	Transition flare	38.85	-.027	-.017	-.003	-.013	-.022			38.85	-.029	-.018	-.004	-.015	-.023
	Upper stage	39.24	-.030	-.015	-.004	-.009	-.019			39.24	-.031	-.016	-.002	-.011	-.018
	Conical fairing	40.85	-.018	-.003	-.010	-.010	-.022			40.85	-.019	-.005	-.009	-.013	-.021
	Transition flare	42.85	-.013	-.009	-.004	-.012	-.023			42.85	-.014	-.010	-.007	-.013	-.022
	Upper stage	43.85	-.023	-.001	.002	-.001	-.015			43.85	-.024	-.001	.001	-.004	-.015
	Conical fairing	44.85	-.020	-.004	.005	.003	-.012			44.85	-.019	-.006	.005	.001	-.011
	Transition flare	45.85	-.020	-.009	.001	-.001	-.012			45.85	-.021	-.010	-.001	-.003	-.011
	Upper stage	47.85	-.020	-.008	-.008	-.009	-.003			47.85	-.022	-.009	-.008	-.011	0
	Conical fairing	49.85	-.028	-.040	-.055	-.072	-.083			49.85	-.029	-.039	-.042	-.071	-.079

TABLE III.-- SURFACE PRESSURE COEFFICIENTS FOR LAUNCH VEHICLE - Concluded

(t) $M = 1.20$; $\alpha = -6^\circ$ to 6° ; $\phi = 90^\circ$

x, in.		C _p for -				Inverted					
		$\alpha=-6^\circ$	$\alpha=-3^\circ$	$\alpha=0^\circ$	$\alpha=3^\circ$	x, in.	$\alpha=-6^\circ$	$\alpha=-3^\circ$	$\alpha=0^\circ$	$\alpha=3^\circ$	$\alpha=6^\circ$
Upright											
11.51	0.065	-0.004	-0.054	-0.114	-0.179	11.51	-0.135	-0.109	-0.088	-0.068	-0.040
12.01	.086	-.080	-.053	.025	.124	12.01	.079	-.004	-.054	-.086	-.084
12.51	.296	-.242	-.214	-.167	-.144	12.51	-.155	-.159	-.217	-.237	-.272
13.51	.092	-.076	-.078	-.106	-.120	13.51	-.132	-.109	-.079	-.069	-.085
14.51	.043	-.035	-.041	-.057	-.083	14.51	-.085	-.065	-.047	-.039	-.052
15.51	.033	-.020	-.018	-.024	-.052	15.51	-.048	-.035	-.024	-.017	-.032
17.01	.025	-.012	-.008	-.015	-.034	17.01	-.030	-.015	-.011	-.013	-.022
19.01	.021	-.011	-.004	-.012	-.024	19.01	-.024	-.013	-.007	-.011	-.017
21.01	.020	-.006	-.009	-.004	-.021	21.01	-.021	-.006	-.010	-.004	-.013
23.01	.212	.199	.205	.216	.185	23.01	.182	.213	.202	.199	.214
24.09	.109	.120	.127	.124	.105	24.09	.104	.122	.124	.121	.121
25.59	.060	.084	.087	.081	.063	25.59	.061	.084	.085	.081	.066
27.59	.033	.053	.057	.053	.026	27.59	.032	.052	.056	.053	.029
Inverted											
28.39	.174	-.171	-.155	-.170	-.187	28.39	-.176	-.170	-.171	-.184	-.195
29.35	.131	-.108	-.094	-.098	-.133	29.35	-.135	-.100	-.094	-.110	-.123
30.35	.087	-.071	-.065	-.071	-.090	30.35	-.085	-.076	-.065	-.064	-.086
31.35	.061	-.052	-.047	-.049	-.071	31.35	-.065	-.054	-.049	-.050	-.068
32.85	.036	-.014	-.016	-.018	-.043	32.85	-.037	-.016	-.018	-.018	-.042
34.85	.052	-.028	-.019	-.030	-.047	34.85	-.054	-.029	-.022	-.022	-.046
36.85	.042	-.020	-.018	-.015	-.044	36.85	-.043	-.022	-.020	-.018	-.039
38.85	.029	-.016	-.009	-.012	-.036	38.85	-.031	-.018	-.011	-.015	-.034
39.24	.035	-.019	-.007	-.010	-.037	39.24	-.037	-.020	-.020	-.009	-.033
40.85	.019	.002	-.006	-.008	-.027	40.85	-.025	-.011	-.002	-.006	-.025
42.85	.022	-.009	-.001	-.017	-.040	42.85	-.028	-.011	-.003	-.019	-.038
44.85	.027	-.010	-.001	-.019	----	44.85	----	-.003	-.003	-.003	-.017

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TABLE III.- LAUNCH VEHICLE SECTION NORMAL-FORCE COEFFICIENTS

(a) $\alpha = \pm 3^\circ$

x, in.		c_n for -							
		$\alpha = -3^\circ$				$\alpha = 3^\circ$			
		M = 0.60	M = 0.80	M = 1.00	M = 1.20	M = 0.60	M = 0.80	M = 1.00	M = 1.20
Conical fairing	12.51	-0.0823	-0.0839	-0.0807	0.0971	-0.0347	-0.0207	0.0791	0.0683
	13.01	-.0655	-.0272	-.0029	.0147	-.0336	.0138	.0400	.0363
	13.51	-.0699	-.0715	-.0480	-.0250	-.0591	-.0500	.0037	-.0160
	14.01	-.0512	-.0643	-.0343	-.0301	-.0494	-.0558	-.0249	-.0315
	14.51	-.0360	-----	-.0359	-.0268	-.0357	-.0441	-.0500	-.0353
	15.01	-.0257	-.0346	-.0256	-.0228	-.0253	-.0299	-.0504	-.0355
	15.51	-.0179	-.0241	-.0204	-.0181	-.0180	-----	-.0347	-.0311
	16.01	-.0132	-.0206	-.0151	-.0125	-.0122	-.0128	-.0227	-.0253
	17.01	-.0088	-.0122	-.0113	-.0100	-.0068	-.0054	-.0074	-.0107
	18.01	-.0065	-.0101	-.0098	-.0064	-.0053	-.0020	-.0041	-.0018
	19.01	-.0052	-.0088	-.0036	-.0073	-.0027	-.0008	-.0126	0
Upper stage	21.01	-.0047	-.0070	-.0021	-.0008	-.0004	.0020	-.0101	.0034
	23.01	-.0115	-.0168	.0027	-.0053	.0267	.0327	.0415	.0072
	24.09	-.0235	-.0206	-.0185	-.0125	.0165	.0208	.0266	.0248
	24.59	-.0217	-.0225	-.0226	-.0224	.0142	.0246	.0253	.0274
	25.59	-.0252	-----	-.0244	-.0271	.0172	.0249	.0270	.0292
	26.59	-.0232	-.0245	-.0252	-.0263	.0167	.0255	.0333	.0230
Transition flare	27.59	-.0210	-.0216	-.0228	-.0294	.0111	.0211	.0481	.0326
	28.09	-.0222	-.0218	-.0206	-----	-.0029	.0015	.0635	.0451
	28.39	-.0005	.0145	-.0205	-.0100	-.0191	-.0403	.0297	.0226
	28.85	-.0079	-.0029	-.0402	-.0230	-.0023	-.0032	-.0230	.0126
	29.35	-.0068	-.0028	-.0152	-.0243	-.0013	.0003	-.0328	.0072
	29.85	-.0081	-.0027	-.0037	-.0148	-.0026	.0005	-.0258	.0020
Main stage	30.35	-.0058	-.0021	.0013	-.0099	-.0013	.0016	-.0107	-.0009
	30.85	-.0044	-.0018	.0012	-.0080	-.0013	.0003	-.0026	.0002
	31.35	-.0053	-.0024	.0033	-.0042	-.0026	-.0008	.0016	0
	31.85	-.0026	-.0024	.0014	-.0023	-.0025	.0008	.0037	-.0012
	32.85	-.0038	-.0024	-.0011	.0046	-.0023	.0011	.0058	-.0060
	33.85	-.0073	-.0029	-.0019	-.0033	-.0038	.0008	.0012	.0023
	34.85	-.0072	-.0039	-.0036	-.0013	-----	.0020	.0050	-.0011
	36.85	-.0050	-.0030	.0040	-.0060	-.0018	-----	-.0046	.0038
	38.85	-.0023	-----	.0019	.0004	-.0023	-----	-.0131	-.0029
	39.24	-.0028	-.0004	.0107	.0065	-.0039	-.0023	-.0143	-.0039
	40.85	-----	-----	-.0060	.0121	-.0016	-----	.0072	-----
	42.85	-.0043	-.0030	-.0056	-.0021	-.0021	0	.0054	.0013
	43.85	-.0049	-.0033	-.0051	-.0042	-.0008	.0009	.0050	-----
	44.85	-.0052	-.0034	-.0047	-.0002	-.0017	.0006	.0045	-.0012

TABLE III.- LAUNCH VEHICLE SECTION NORMAL-FORCE COEFFICIENTS - Concluded

(b) $\alpha = \pm 6^\circ$

x, in.		c _n for -							
		$\alpha = -6^\circ$				$\alpha = 6^\circ$			
		M = 0.60	M = 0.80	M = 1.00	M = 1.20	M = 0.60	M = 0.80	M = 1.00	M = 1.20
Conical fairing	12.51	-0.1375	-0.1012	0.0701	0.0639	-0.0283	-0.0314	0.0749	0.0807
	13.01	-.0998	-.0644	-.0671	-.0066	-.0187	.0189	.0476	.0472
	13.51	-.0896	-.0941	-.0879	-.0415	-.0435	-.0433	.0106	.0023
	14.01	-.0657	-.0795	-.0378	-.0400	-.0379	-.0540	-.0340	-.0253
	14.51	-.0504	-.0612	-.0287	-.0309	-.0254	-----	-.0643	-.0373
	15.01	-.0359	-.0453	-.0254	-.0244	-.0152	-.0275	-.0663	-.0387
	15.51	-.0281	-.0356	-.0198	-.0156	-.0075	-.0143	-.0516	-.0360
	16.01	-.0262	-.0310	-.0186	-.0090	-.0018	-.0067	-.0354	-.0304
	17.01	-.0209	-.0224	-.0172	-.0020	-.0033	.0003	-.0111	-.0192
	18.01	-.0150	-----	-.0177	-----	-.0063	.0055	-.0061	-.0061
	19.01	-.0159	-.0188	-.0141	-----	-----	.0073	-.0287	.0025
Upper stage	21.01	-.0160	-.0174	-.0142	-.0033	.0136	.0109	-.0059	.0013
	23.01	-.0498	-.0547	-.0582	-.0526	.0660	.0734	.0751	.0428
	24.09	-.0441	-.0519	-.0532	-.0414	.0518	.0531	.0560	.0556
	24.59	-.0453	-.0544	-.0541	-.0472	.0516	.0524	.0519	.0565
	25.59	-.0477	-.0558	-.0591	-.0602	.0535	.0556	.0595	.0596
	26.59	-.0465	-.0559	-.0636	-.0603	.0496	.0564	.0639	.0652
	27.59	-.0381	-.0504	-.0706	-.0695	.0415	.0467	.0823	.0682
	28.09	-.0292	-.0394	-.0693	-.0710	.0227	.0254	.0391	.0761
	28.39	.0111	.0239	-.0343	-.0329	-.0255	-.0418	.0472	.0423
	28.85	-.0100	-.0104	-.0479	-.0290	.0092	.0102	.0258	.0322
	29.35	-.0084	-.0096	-.0178	-.0342	.0101	.0116	-.0119	.0273
Main stage	29.85	-.0078	-.0102	.0286	-.0274	.0085	.0131	-.0237	.0184
	30.35	-.0074	-.0085	.0193	-.0168	.0093	.0130	-.0148	.0111
	30.85	-.0049	-.0079	.0061	-.0069	.0084	.0108	-.0056	.0028
	31.35	-.0043	-.0083	.0084	-.0013	.0071	.0108	-.0015	-.0008
	31.85	-.0041	-.0082	.0021	-.0040	.0075	.0105	.0037	.0034
	32.85	-.0049	-.0093	-.0013	-.0062	.0085	.0118	.0098	.0059
	33.85	-.0037	-.0083	.0035	-.0049	.0061	.0111	.0044	.0051
	34.85	-.0067	-----	-.0047	.0042	.0108	.0121	.0101	-.0030
	36.85	-.0042	-.0082	.0030	-.0078	.0063	.0114	-.0068	.0078
	38.85	-.0050	-----	-.0122	-.0083	.0073	.0120	-.0136	.0065
	39.24	.0036	.0010	.0002	.0046	.0017	-----	-.0163	-.0040
	40.85	-.0056	-.0080	-.0123	-.0107	.0093	.0127	.0142	.0098
	42.85	-.0048	-.0095	-.0080	-.0164	.0071	.0120	.0107	.0174
	43.85	-.0046	-.0112	-.0089	-.0019	.0067	.0123	.0109	.0017
	44.85	-.0060	-.0114	-.0084	-.0058	.0061	.0123	.0094	.0068

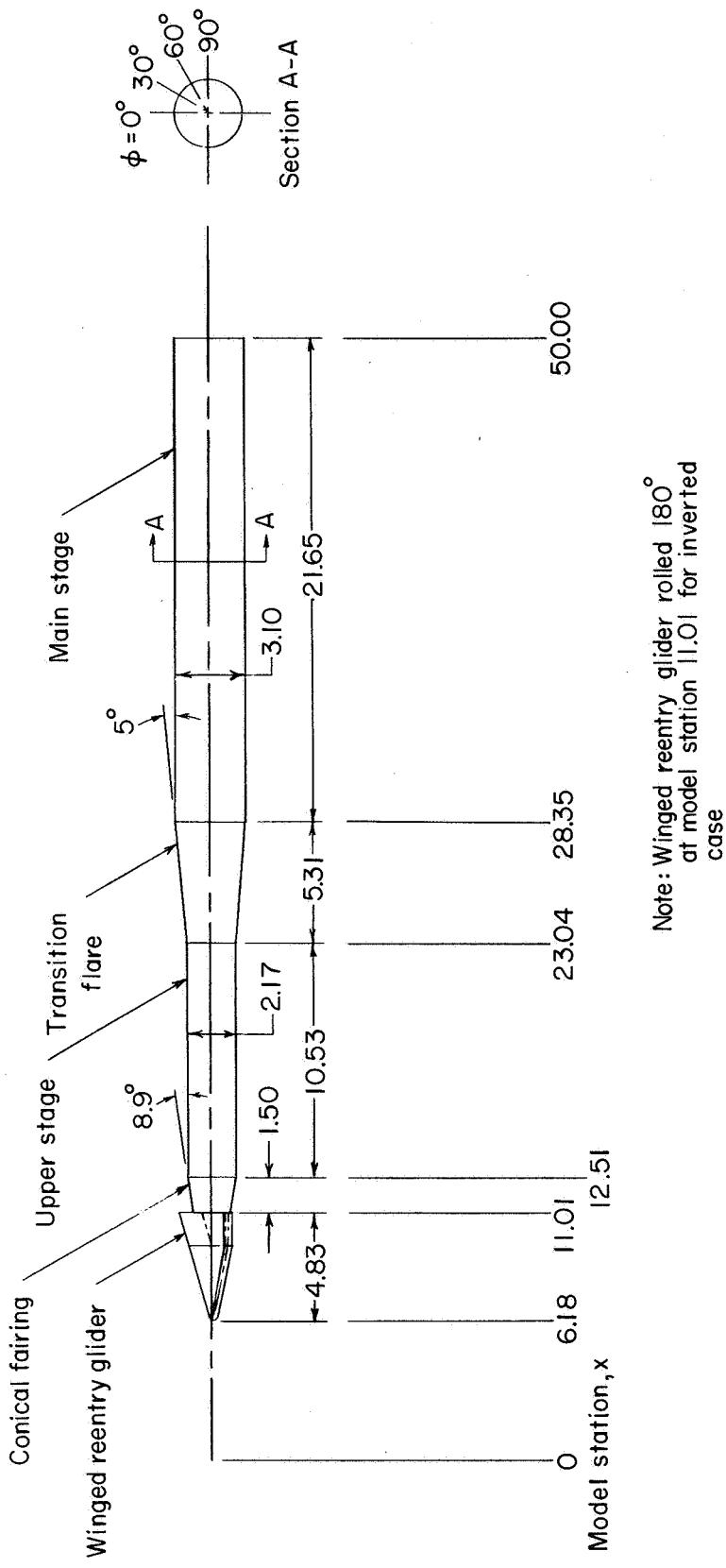
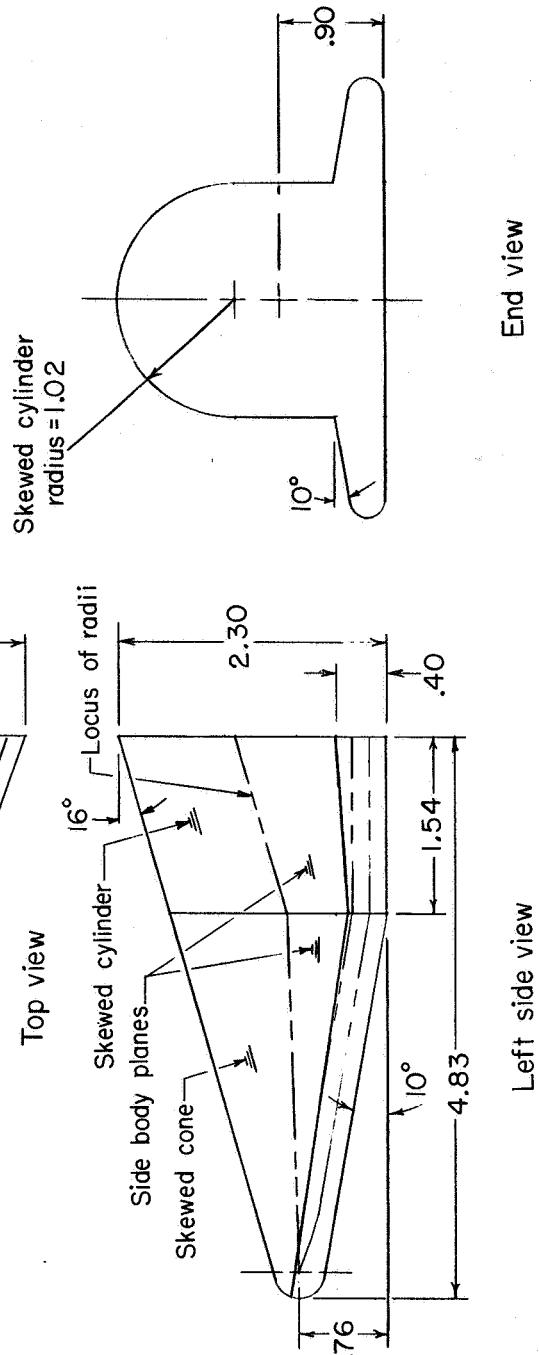
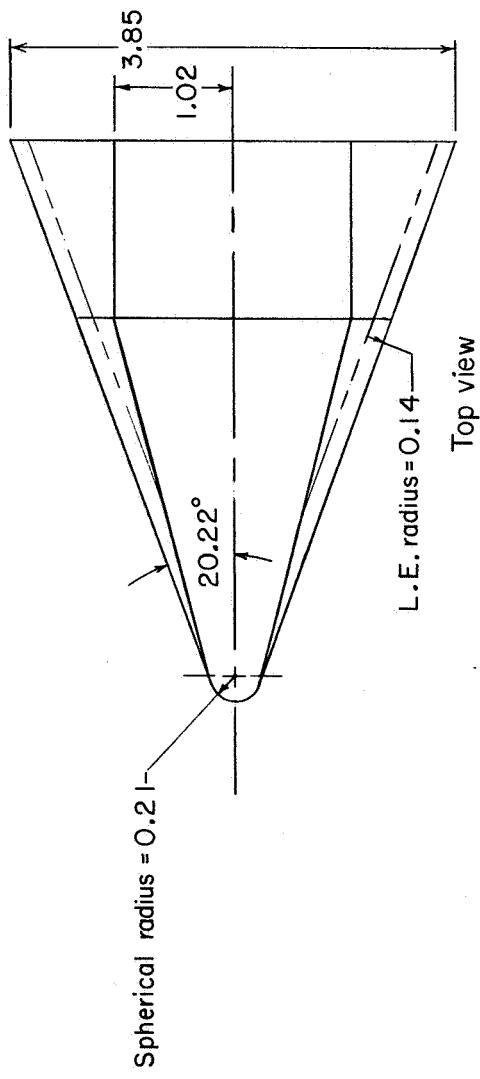
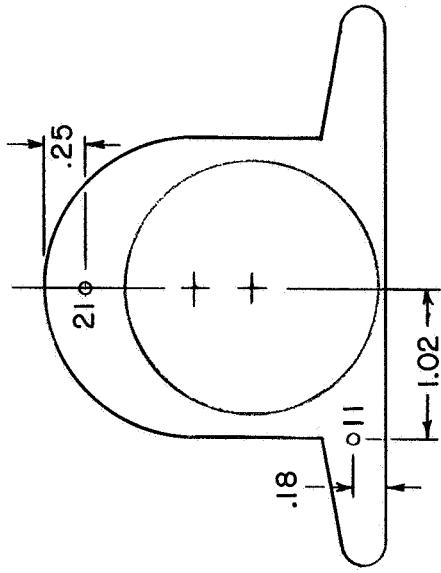


Figure 1.- Model details. All dimensions are in inches unless otherwise specified.



(b) Winged reentry glider.

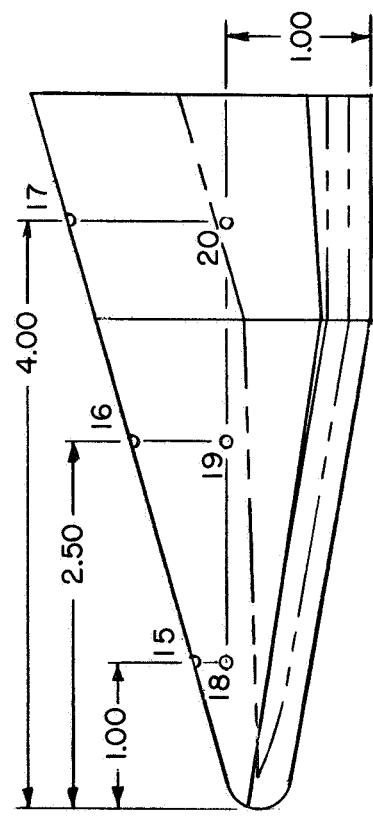
Figure 1.- Continued.



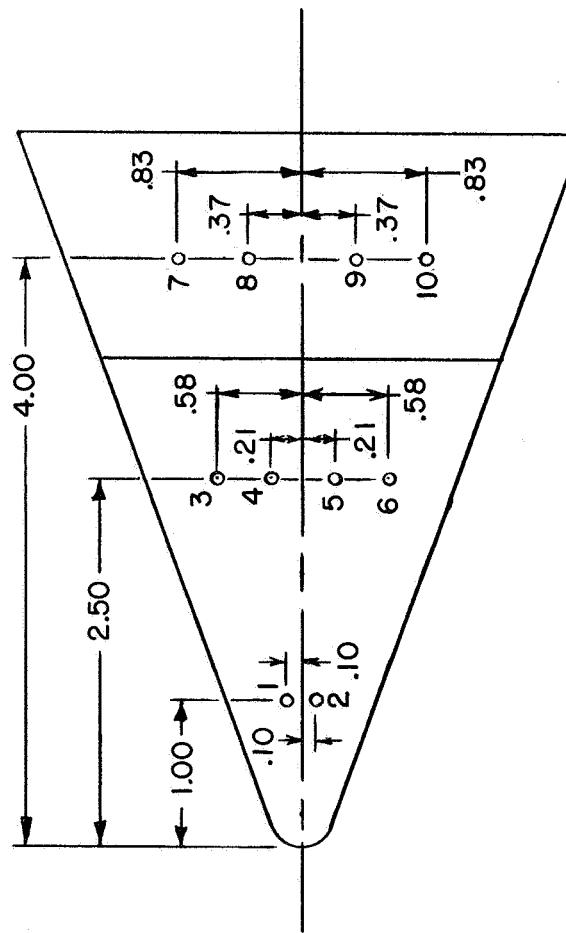
End view

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Note: Orifices |2, |3, and |4 are on right side and correspond to orifices |8, |9, and 20, respectively



Left side view

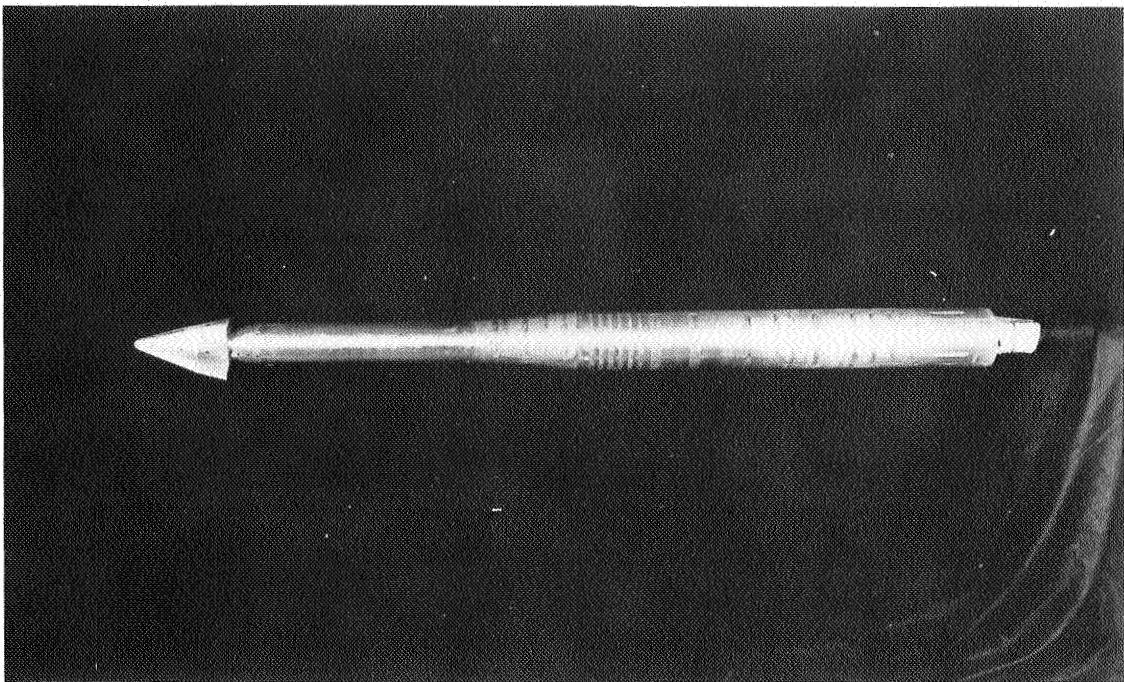


Bottom view

(c) Location of orifices on winged reentry glider.

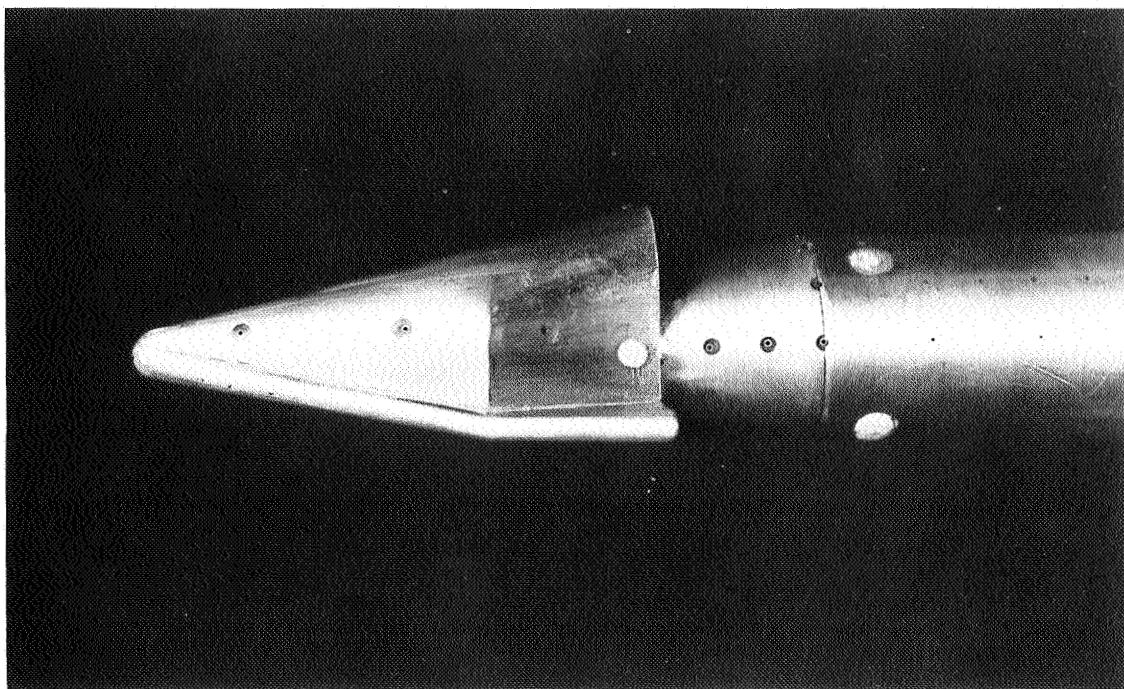
Figure 1.- Concluded.

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(a) Winged reentry glider and launch vehicle.

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(b) Winged reentry glider.

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Figure 2.- Model photographs.

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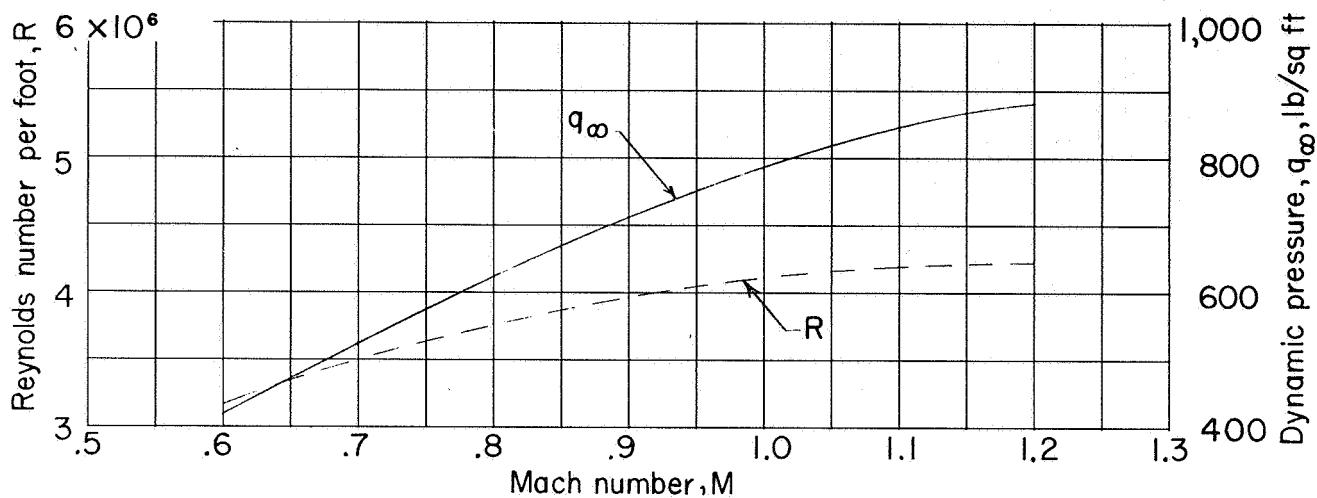


Figure 3.- Variation with Mach number of average test Reynolds number per foot and dynamic pressure.

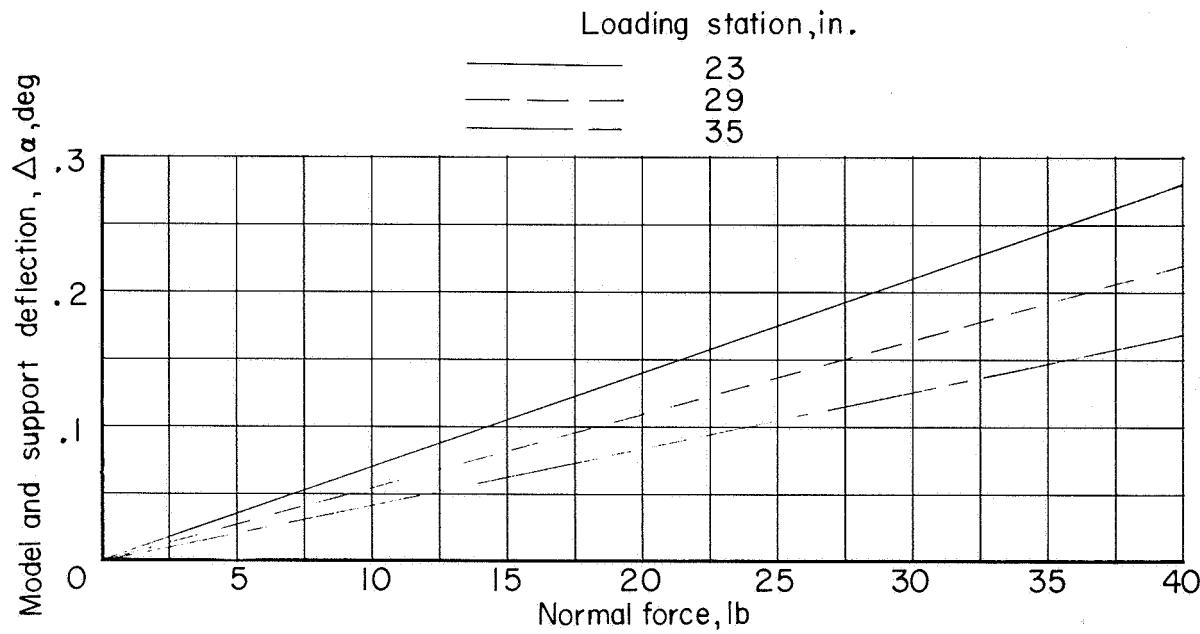
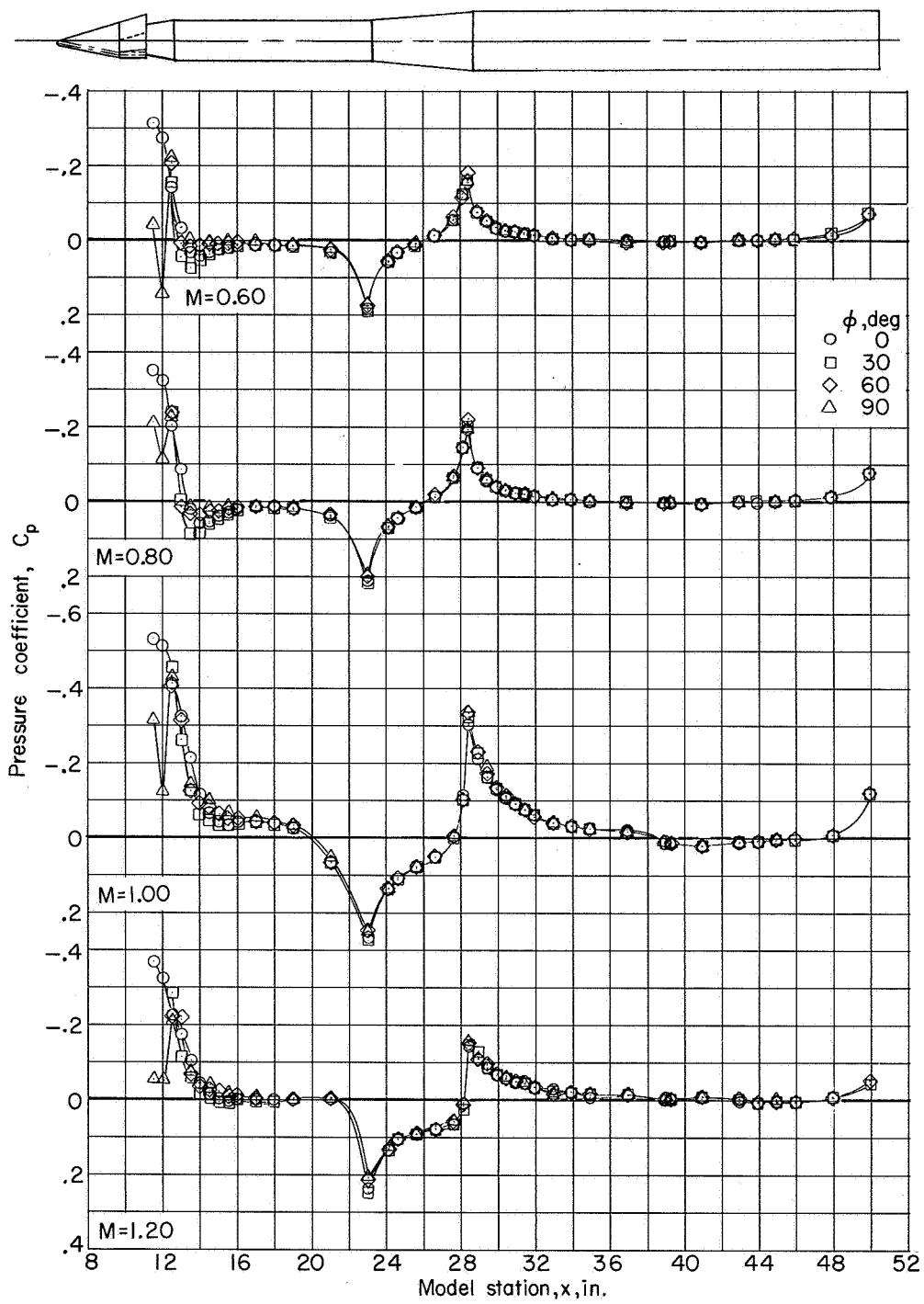


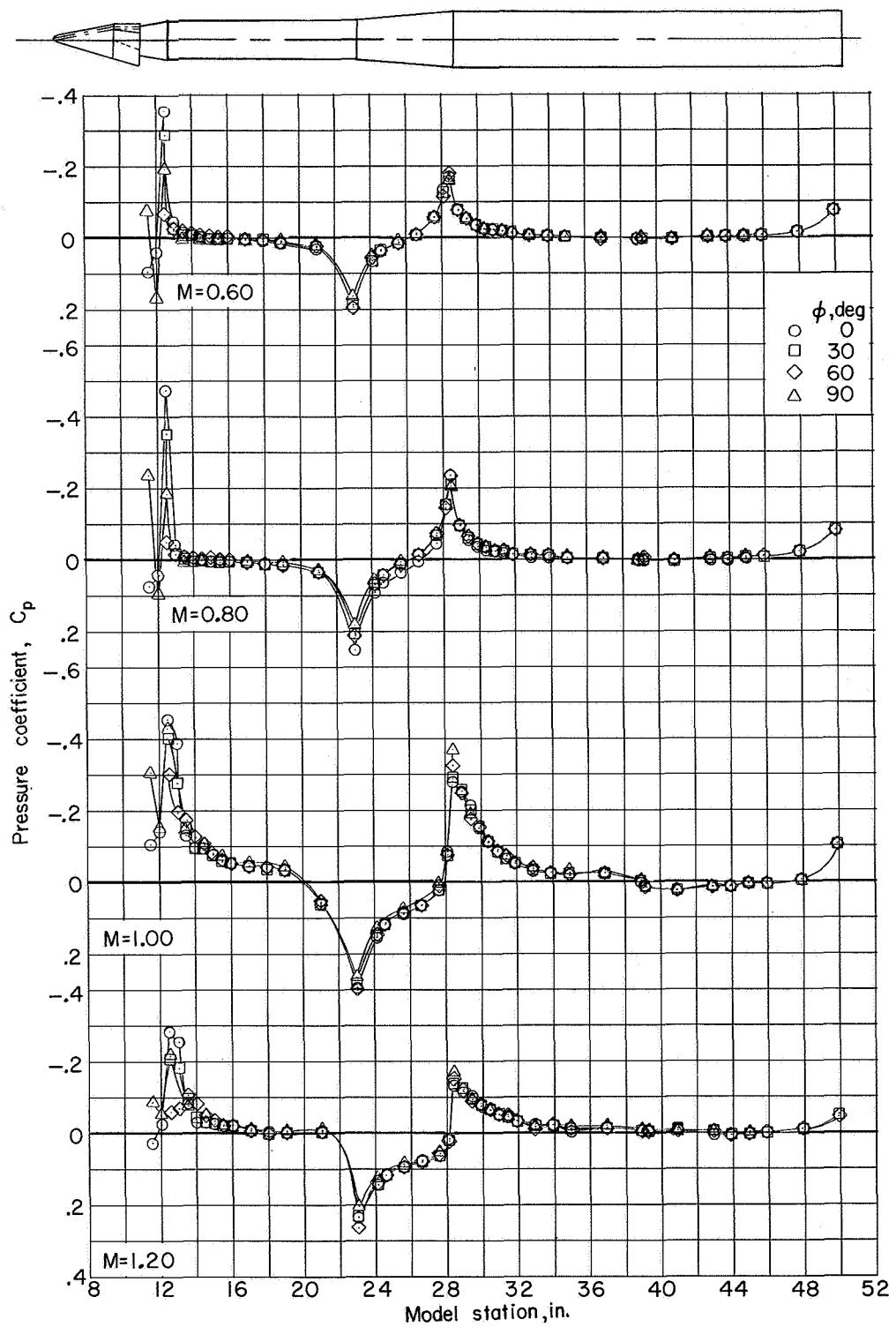
Figure 4.- Variation of model and support deflection with normal force.



(a) Winged reentry glider upright.

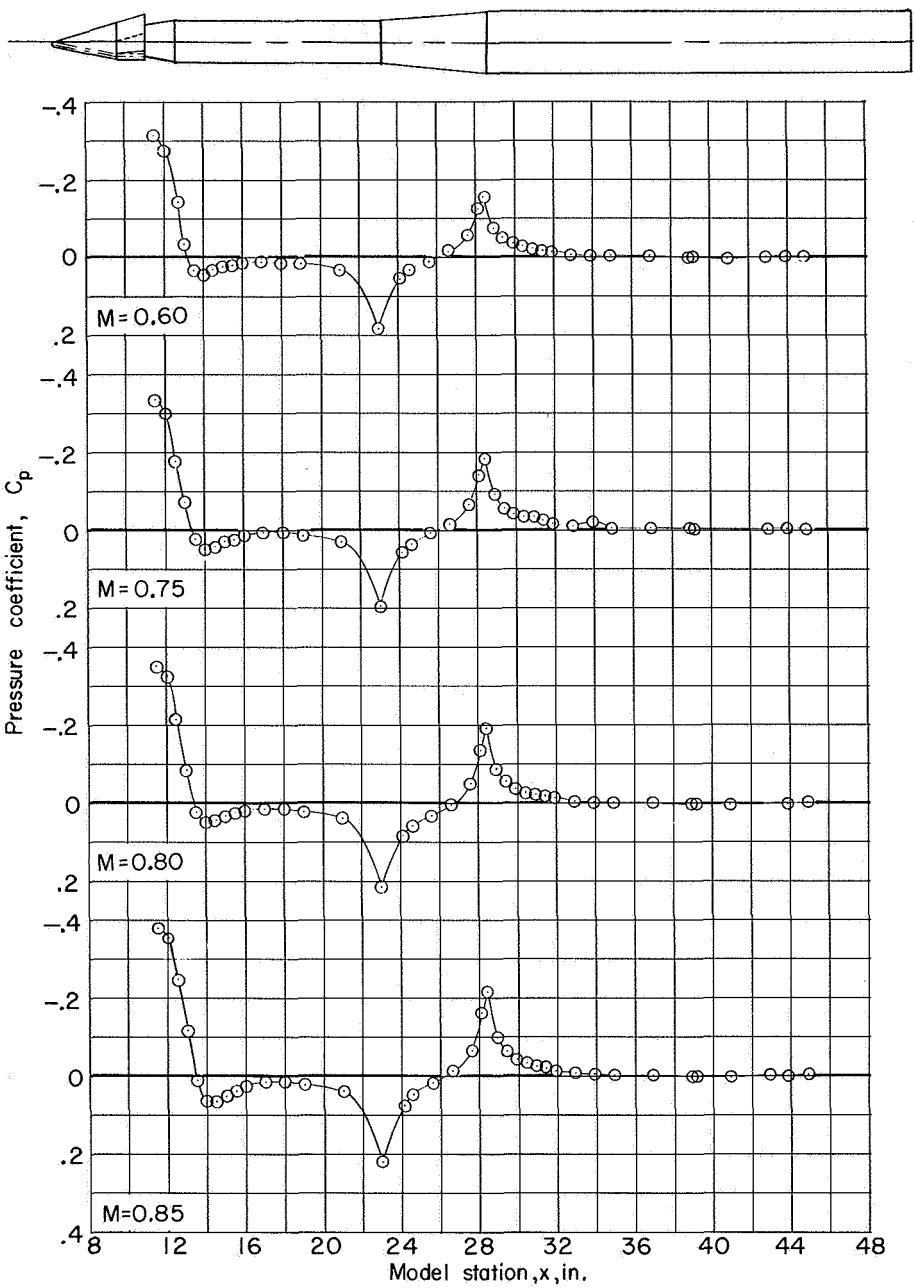
Figure 5.- Comparison of surface-pressure coefficients on launch vehicle at orifice-row-orientation angles of 0° , 30° , 60° , and 90° ; $\alpha = 0^\circ$.

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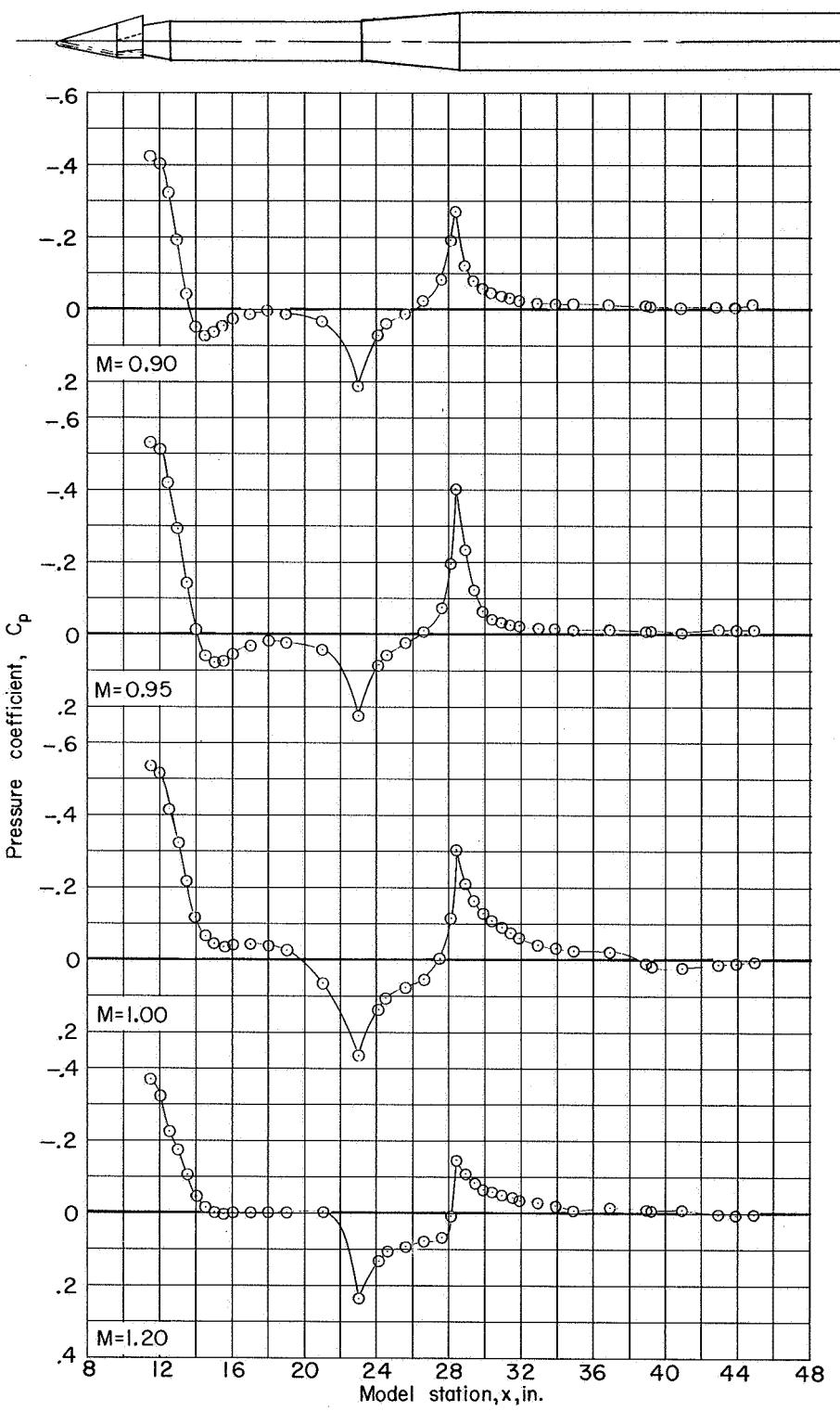
(b) Winged reentry glider inverted.

Figure 5.- Concluded.



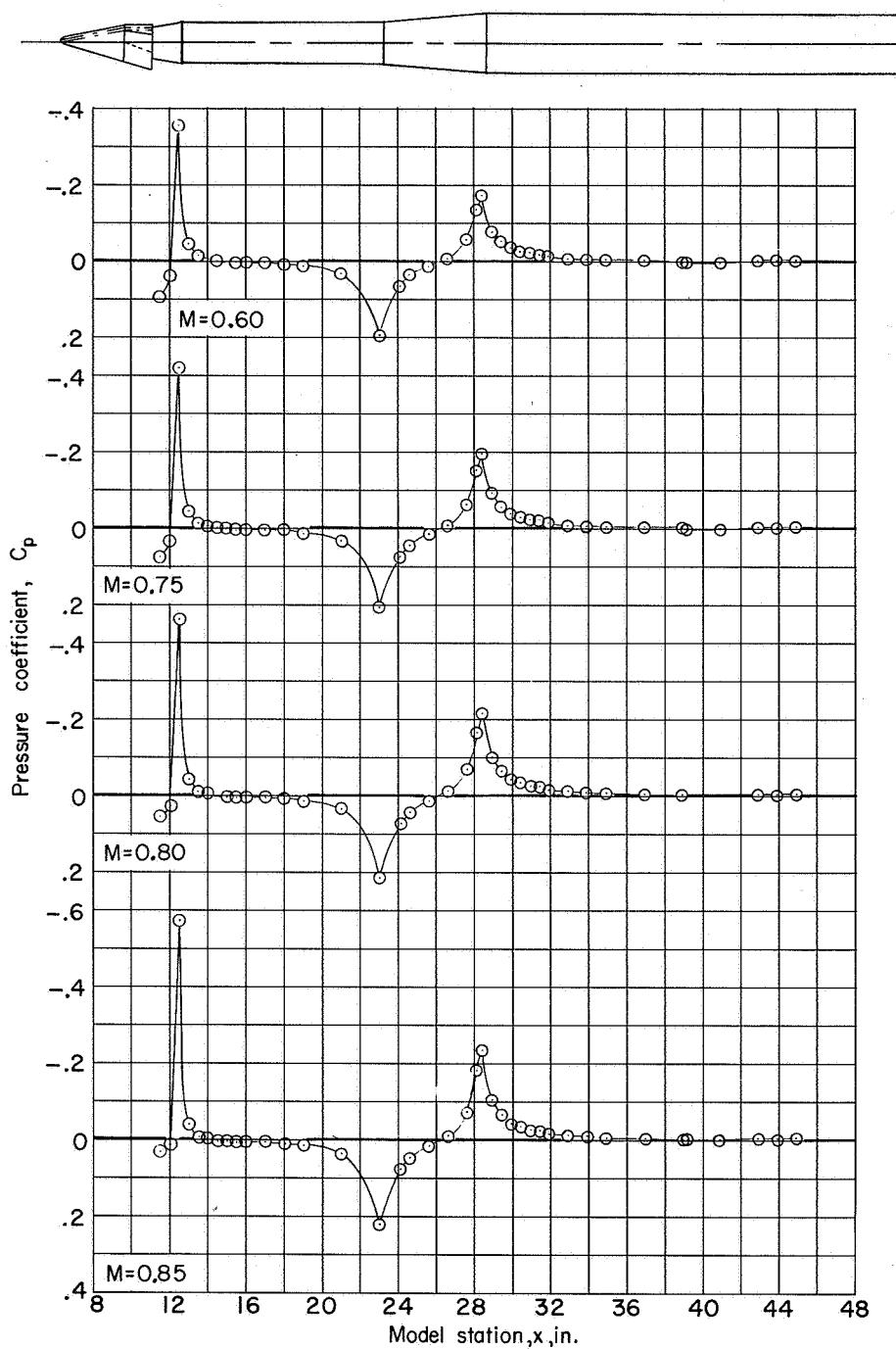
(a) Winged reentry glider upright; $\phi = 0^\circ$.

Figure 6.- Variation with longitudinal model station of surface pressure coefficients on launch vehicle; $\alpha = 0^\circ$.



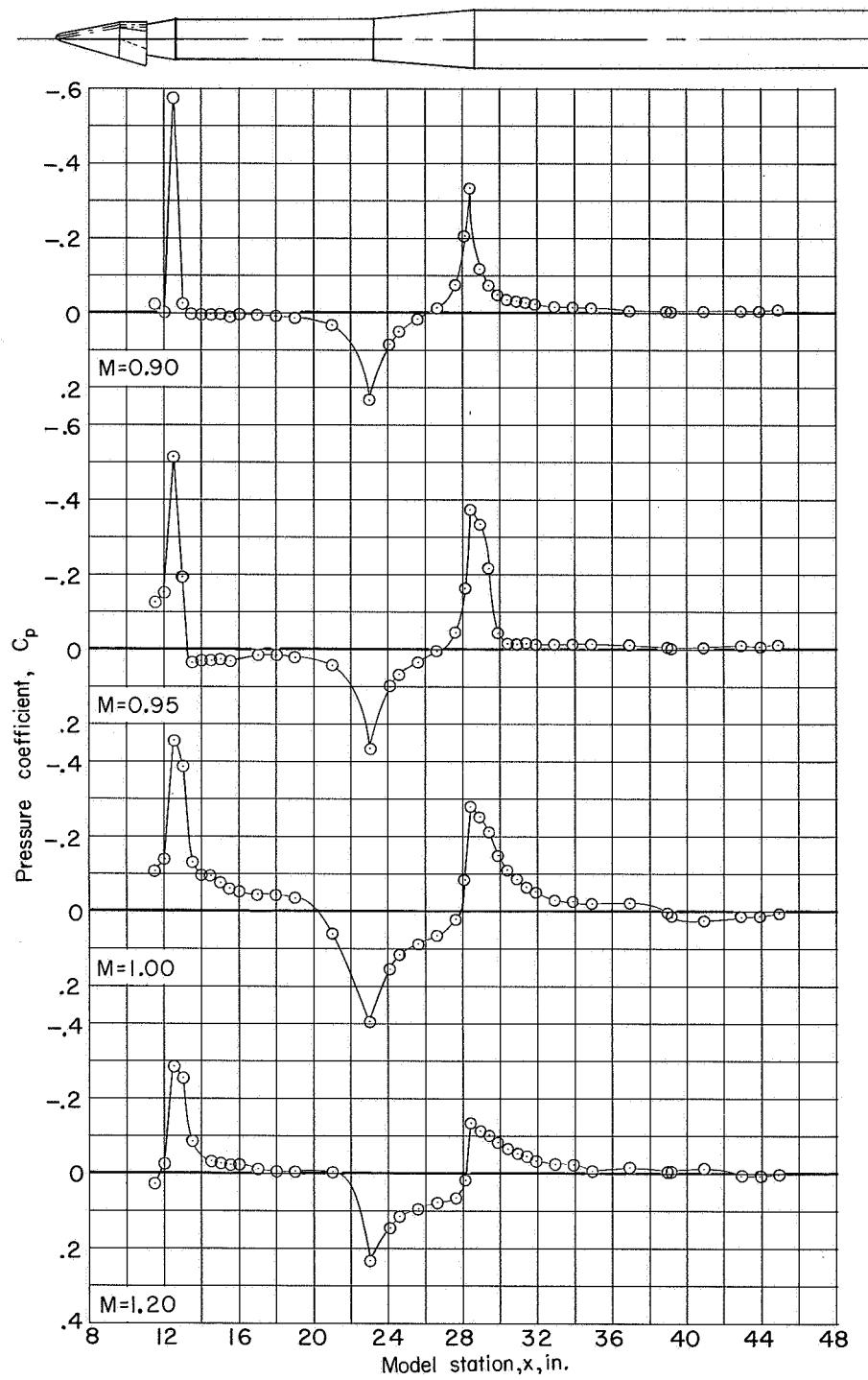
(a) Concluded.

Figure 6.- Continued.



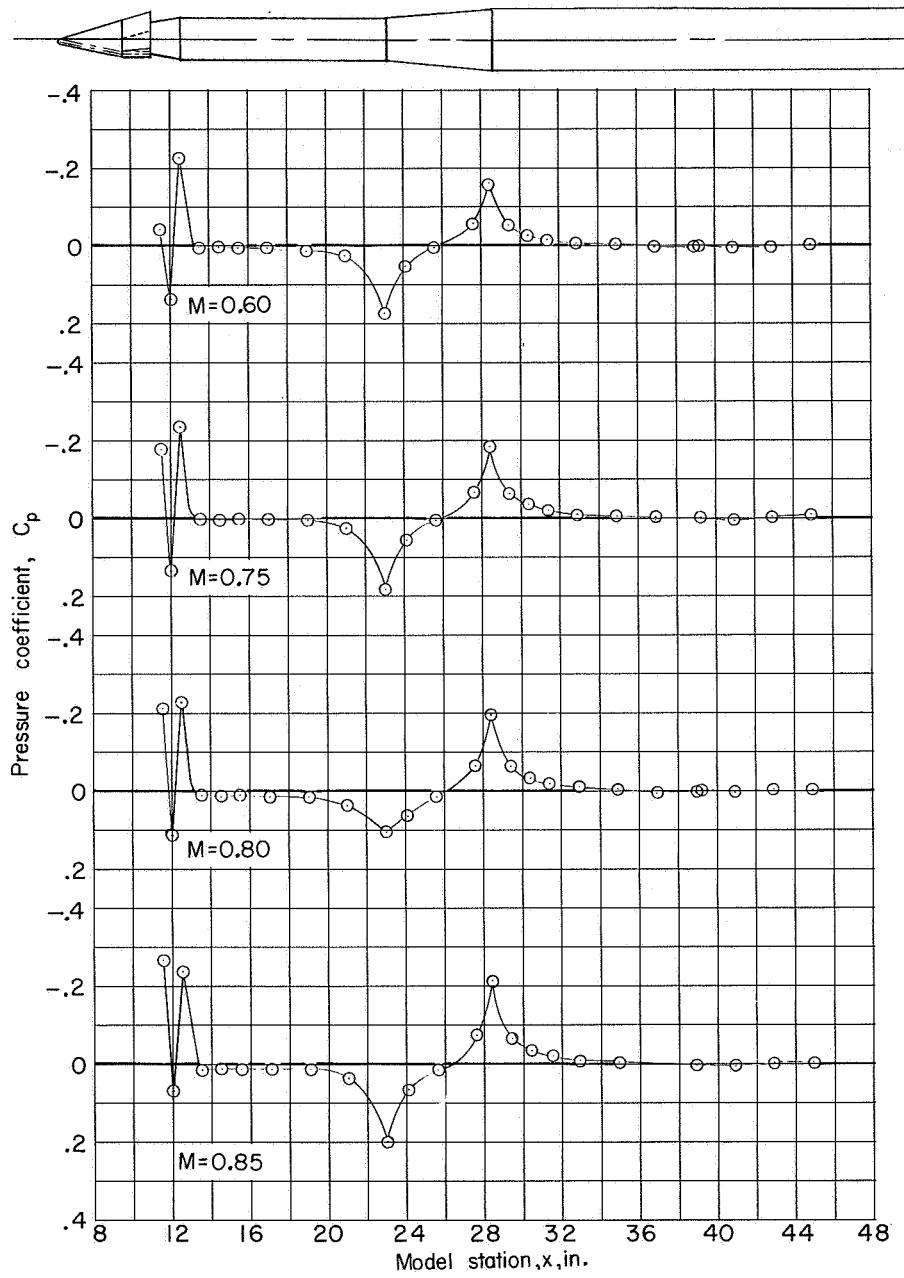
(b) Winged reentry glider inverted; $\phi = 0^\circ$.

Figure 6.- Continued.



(b) Concluded.

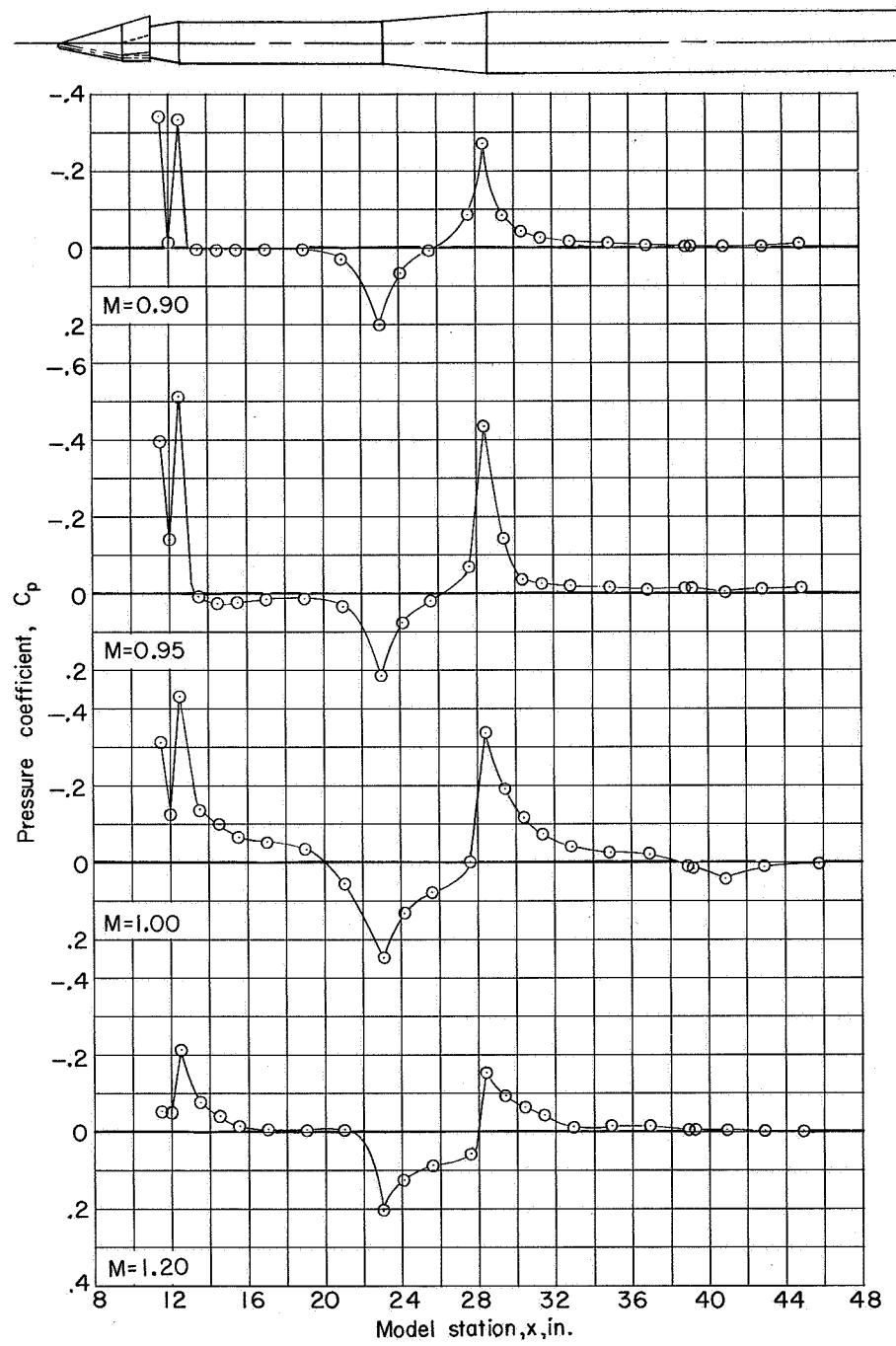
Figure 6.- Continued.



(c) Winged reentry glider upright; $\phi = 90^\circ$.

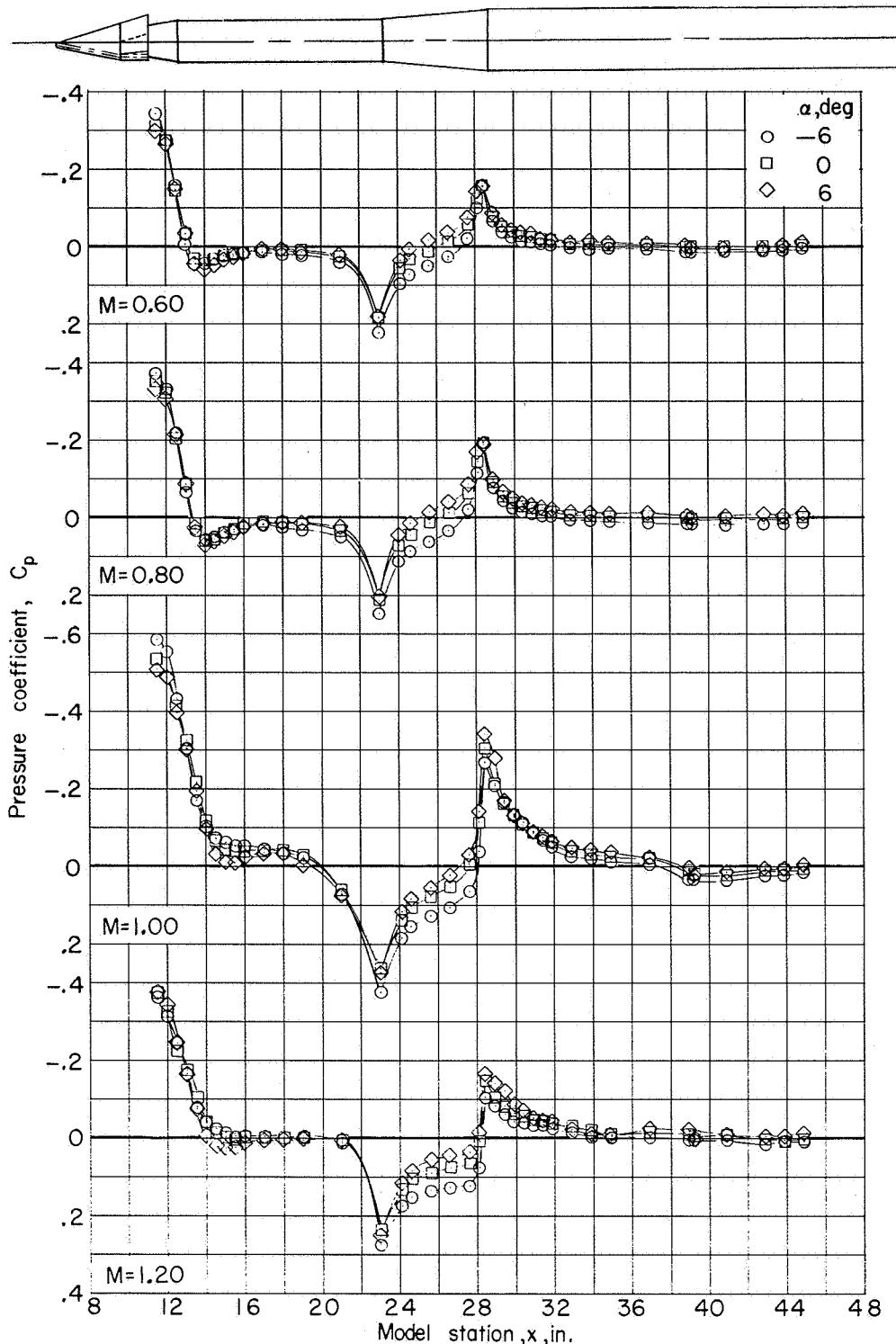
Figure 6.- Continued.

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(c) Concluded.

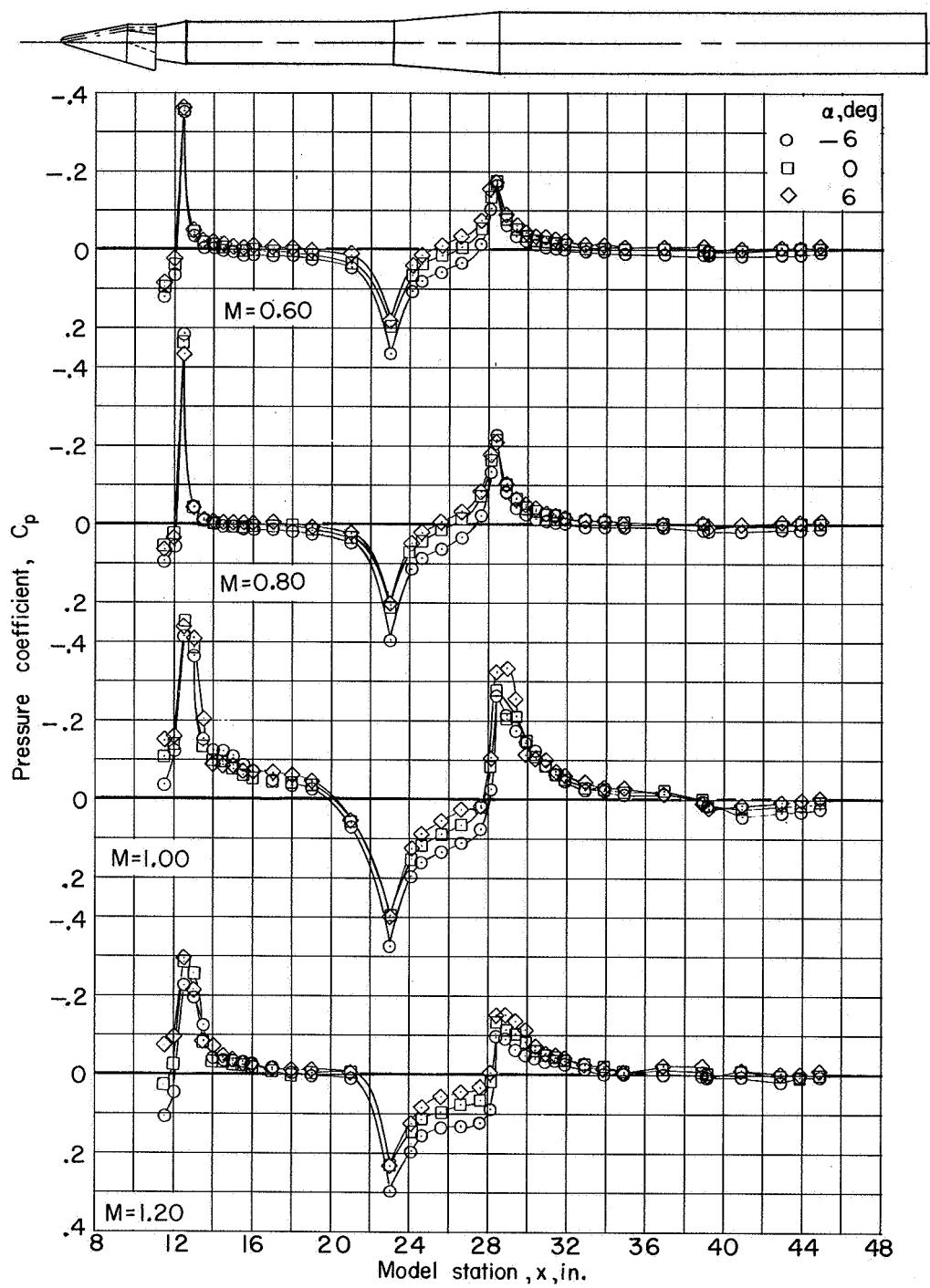
Figure 6.- Concluded.



(a) Winged reentry glider upright.

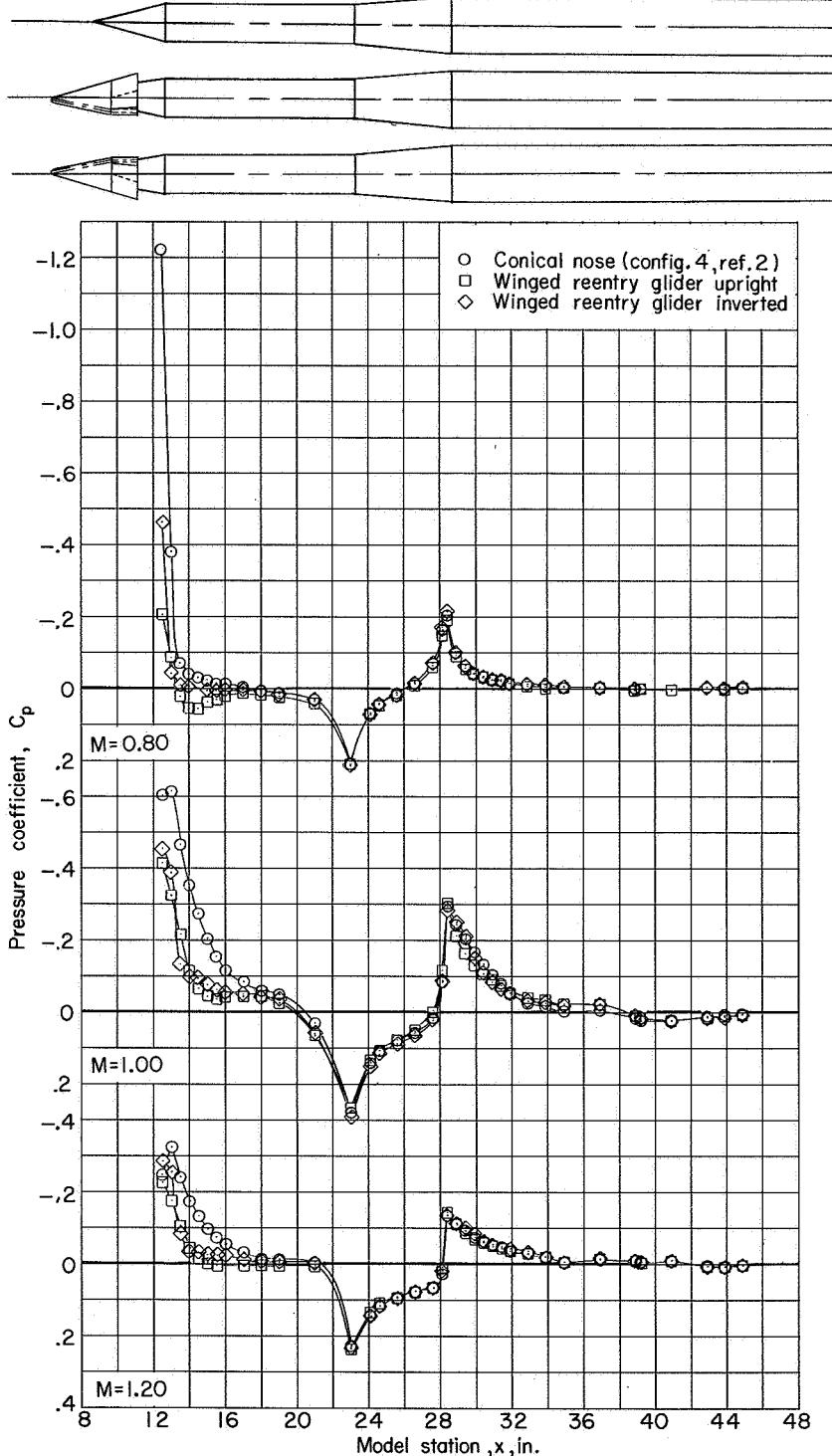
Figure 7.- Effect of angle of attack on launch-vehicle pressure coefficients. $\phi = 0^\circ$.

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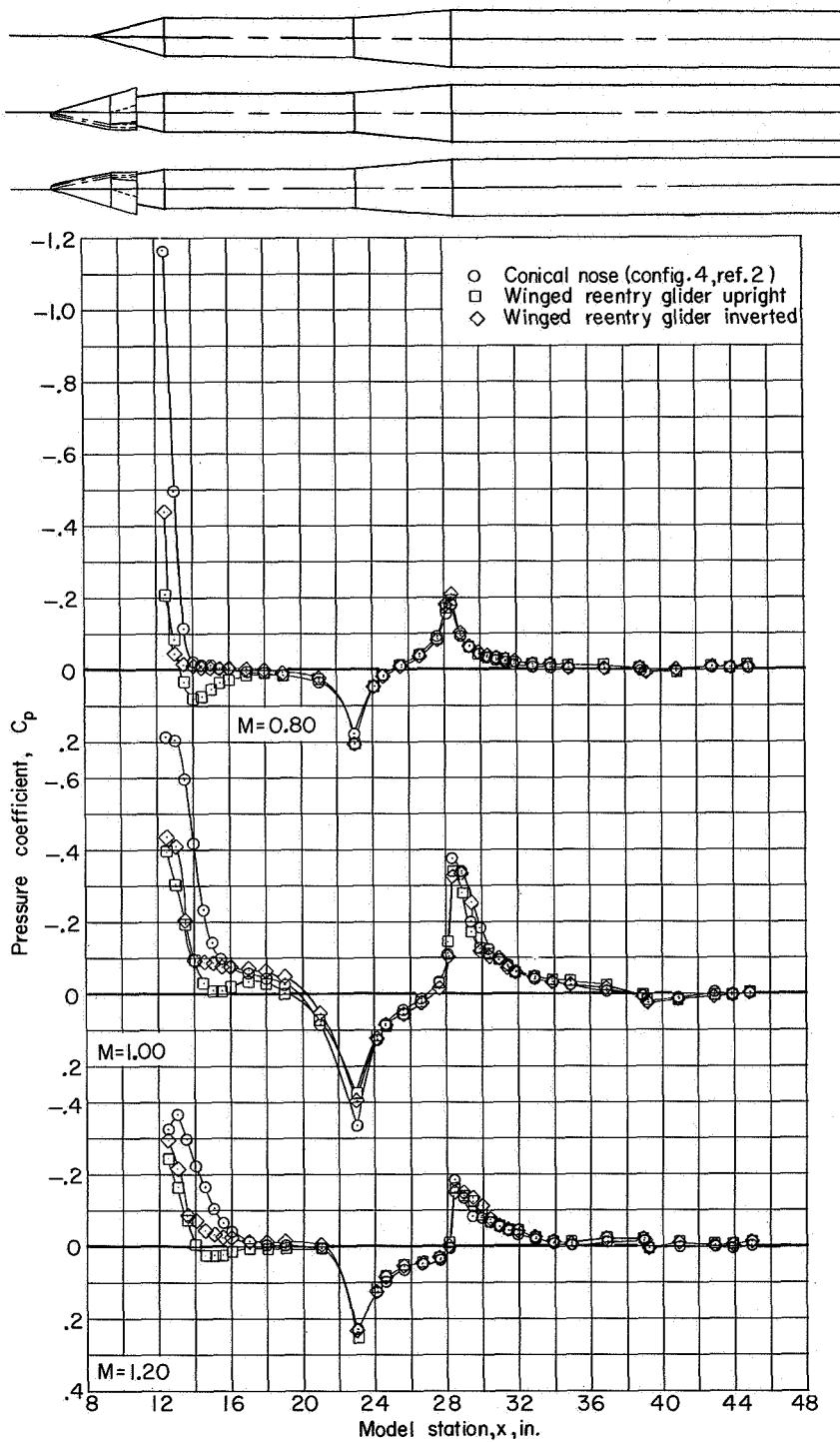
(b) Winged reentry glider inverted.

Figure 7.- Concluded.



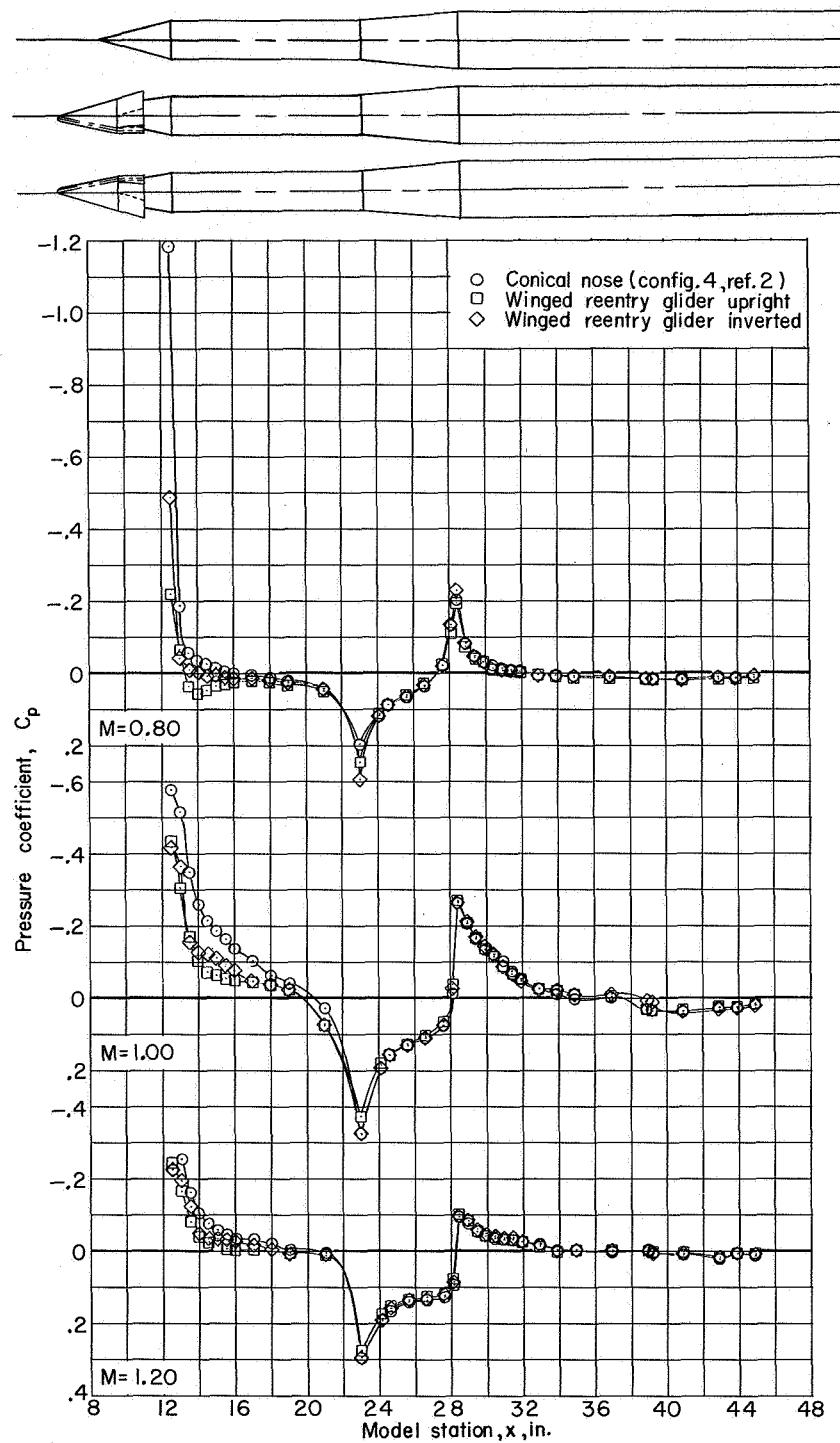
(a) $\alpha = 0^\circ$.

Figure 8.- Comparison of surface-pressure coefficients on launch vehicle with conical nose (15.3° half-angle) and winged reentry glider; $\phi = 0^\circ$.



(b) $\alpha = 6^\circ$.

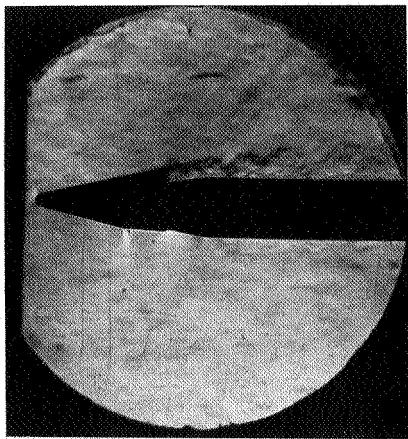
Figure 8.- Continued.



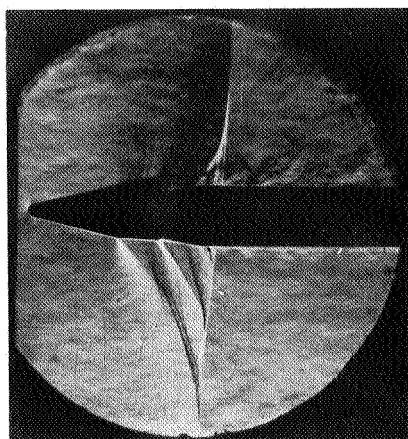
(c) $\alpha = -6^\circ$.

Figure 8.- Concluded.

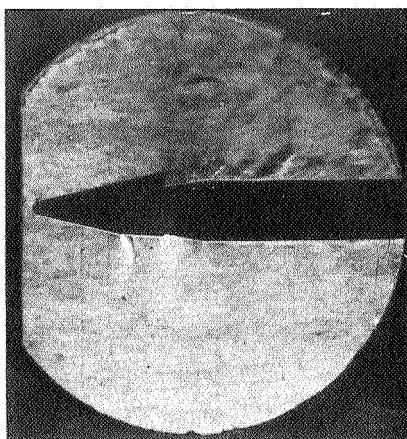
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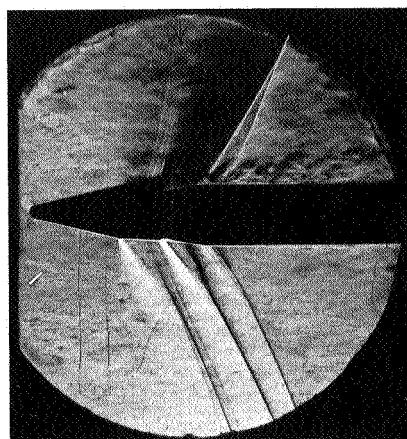
M=0.80



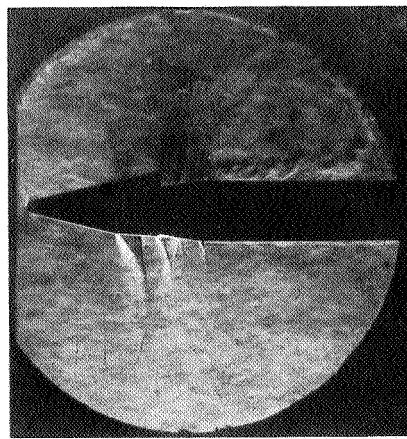
M=0.95



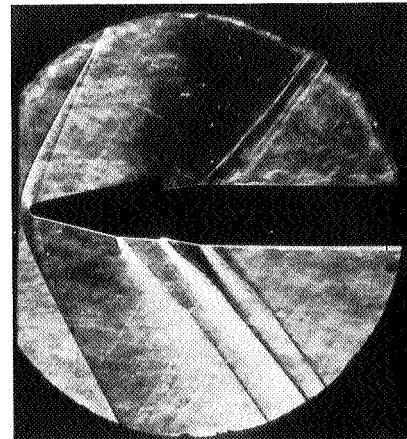
M=0.85



M=1.00



M=0.90



M=1.20

L-64-8391

Figure 9.- Schlieren photographs of winged reentry glider and forward portion of launch vehicle; $\alpha = 0^\circ$.

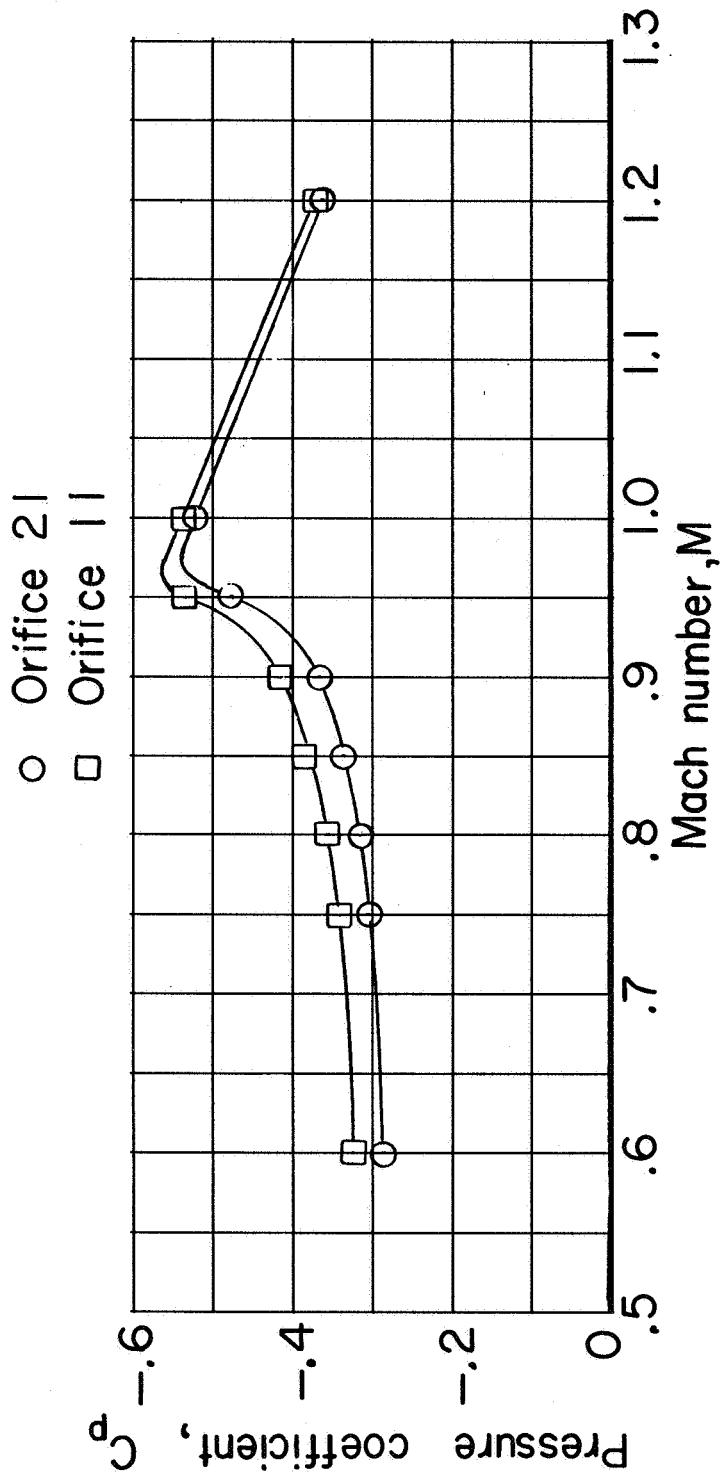
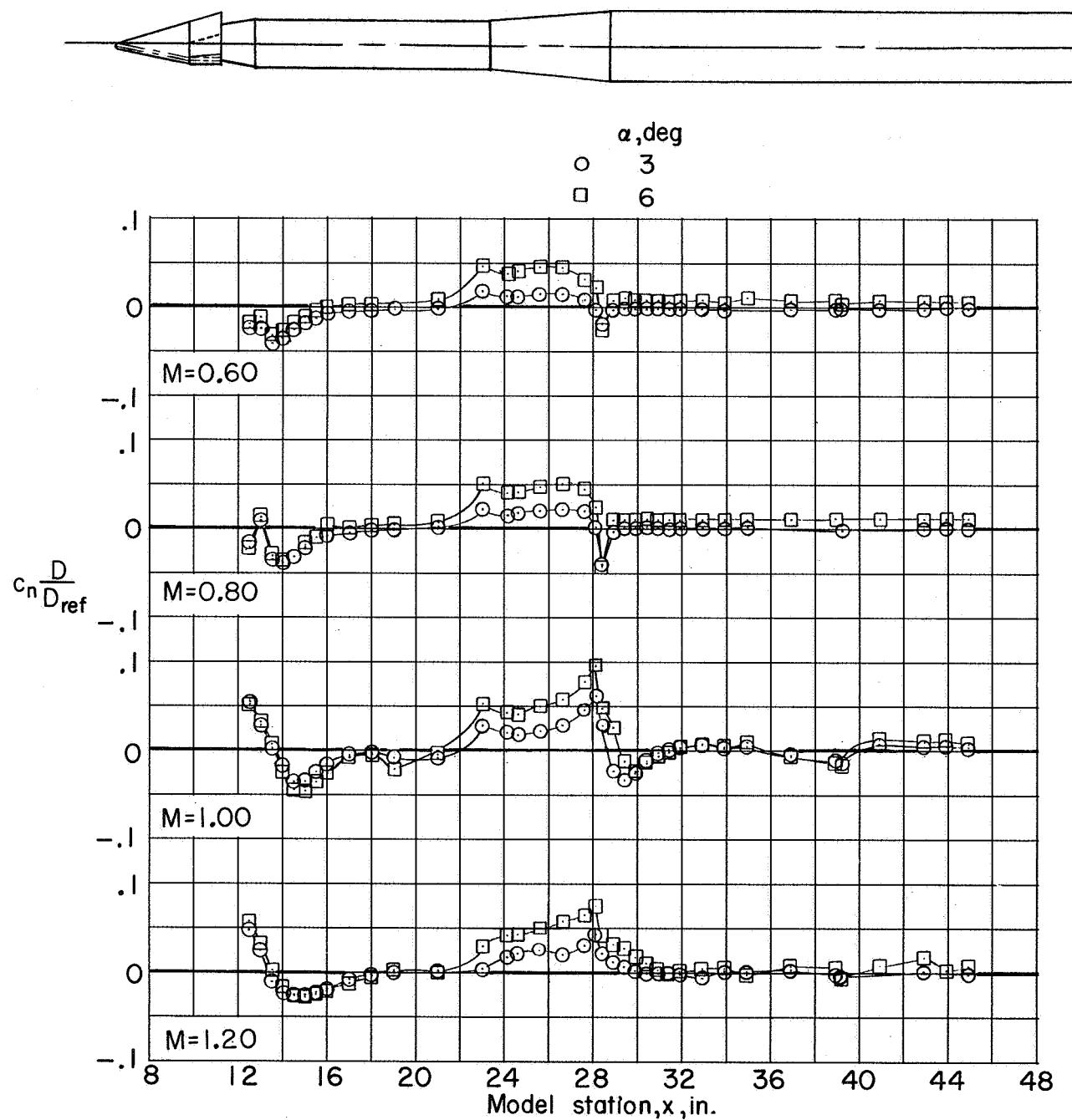


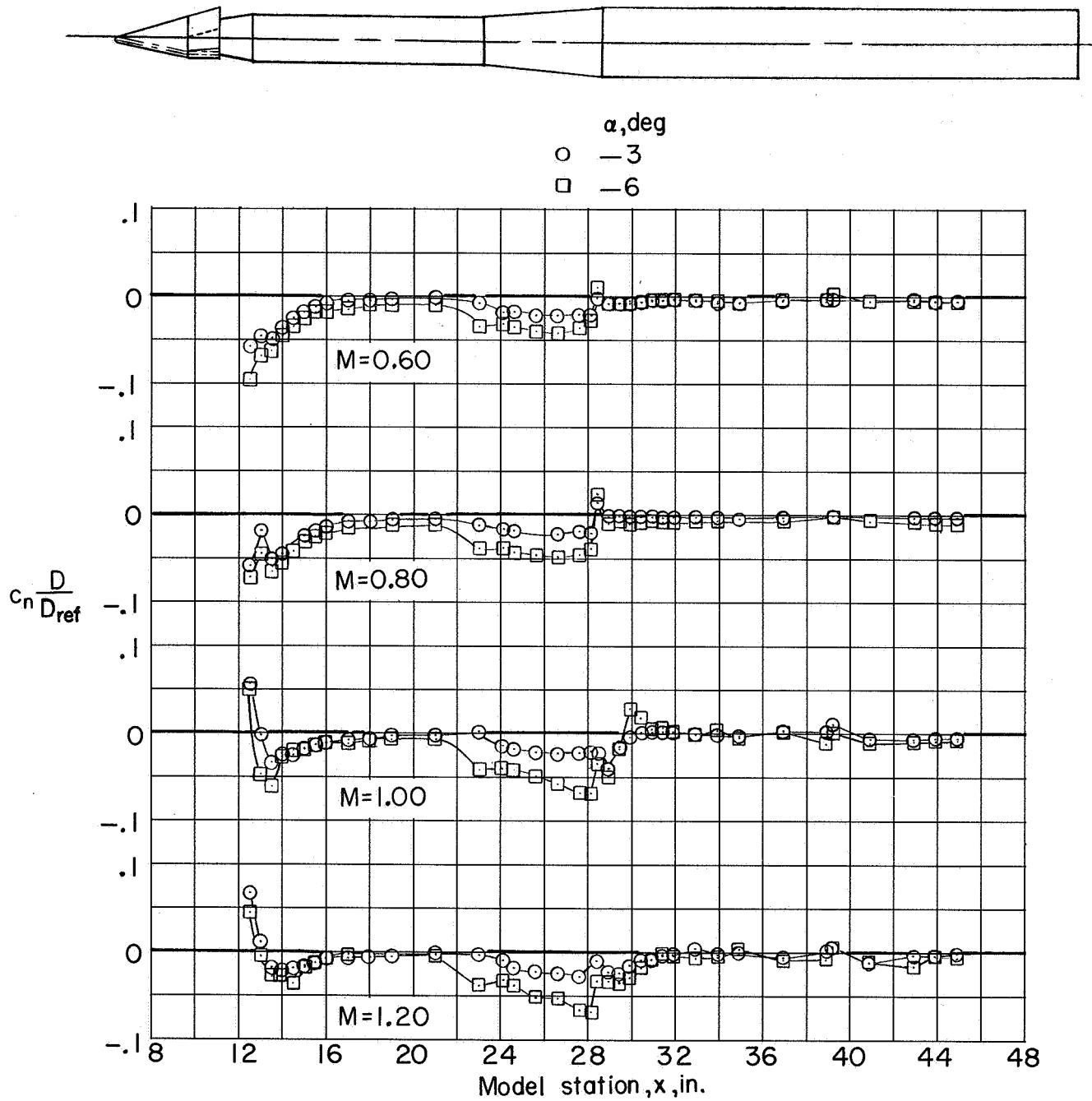
Figure 10.- Variation with Mach number of surface-pressure coefficients on winged reentry glider at base of the wing (orifice 11) and at base of skewed cylinder (orifice 21). Winged reentry glider upright; $\alpha = 0^\circ$.



(a) $\alpha = 3^\circ$ and 6° .

Figure 11.- Variation with longitudinal model station of launch-vehicle section normal-force coefficients.

~~CONFIDENTIAL~~



(b) $\alpha = -3^\circ$ and -6° .

Figure 11.- Concluded.

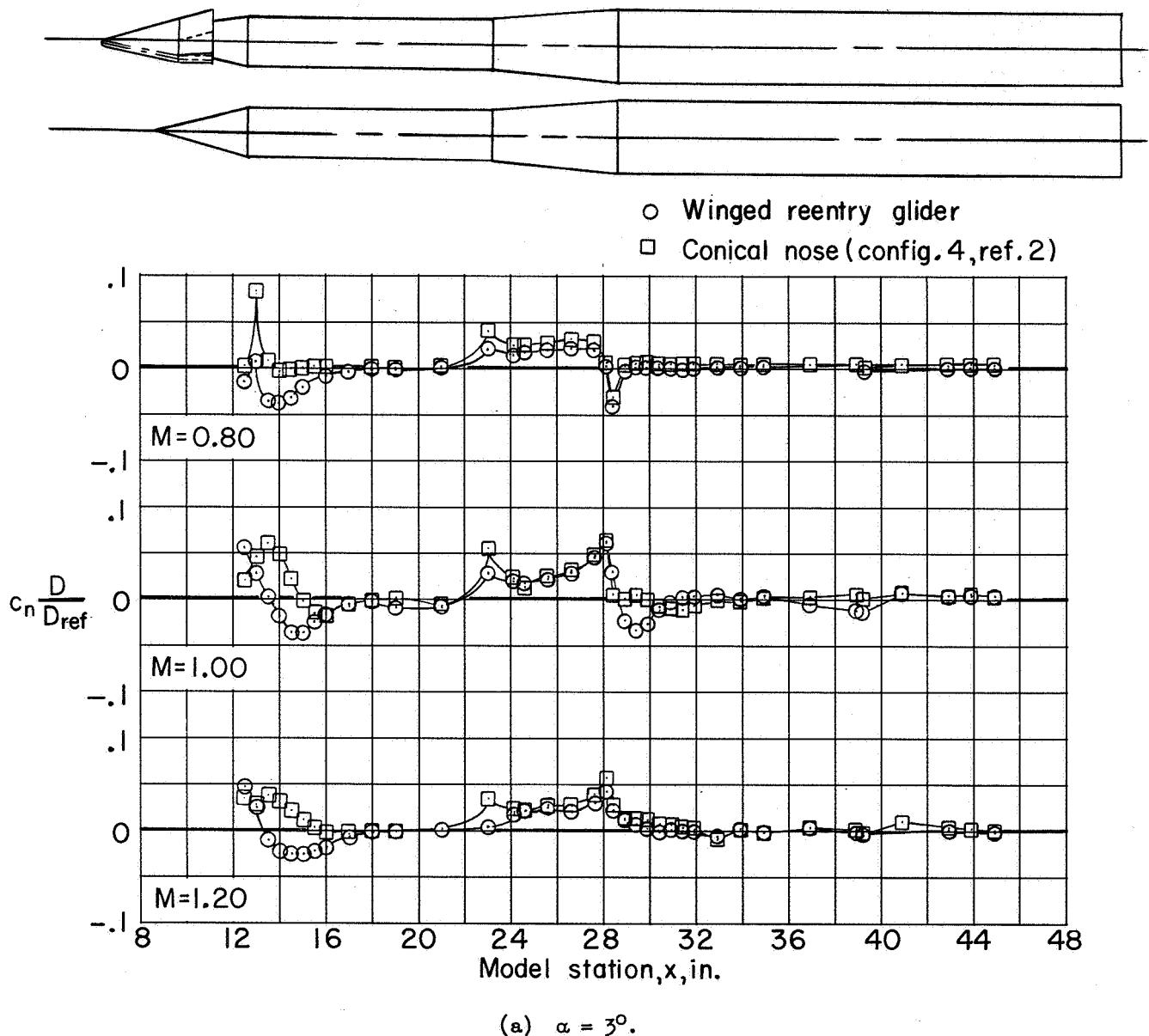
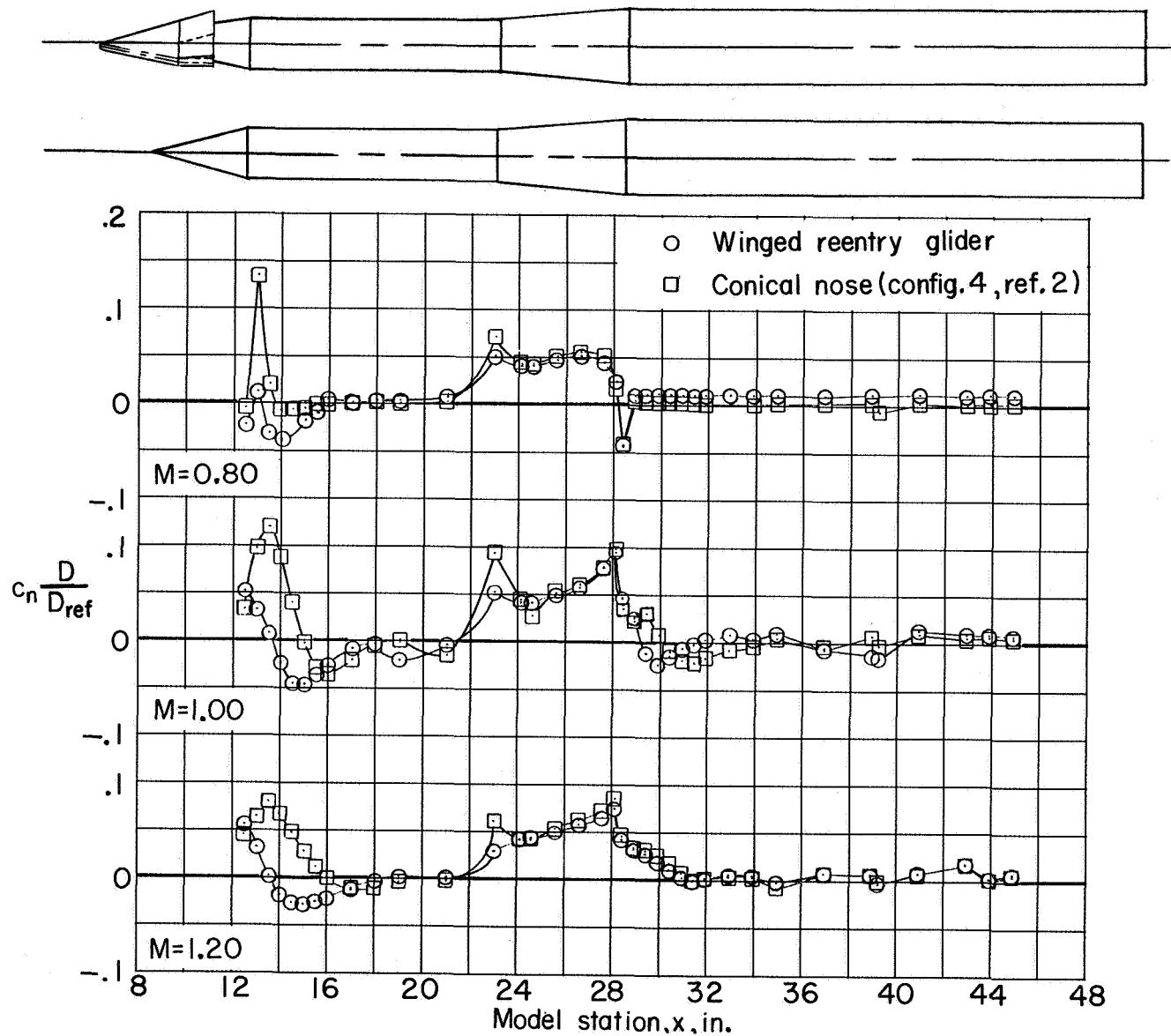


Figure 12.- Comparison of normal-force section-coefficient distribution on launch vehicle with winged reentry glider and with conical nose (15.3° half-angle).

~~CONFIDENTIAL~~



(b) $\alpha = 6^\circ$.

Figure 12..- Concluded.